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MR. WILLIAM M. COURTIS, mining engineer, of Detroit, has gone to examine the reported gold discoveries in Northern Minnesota, in the interest of Michigan owners.

MR. DOUGLAS BROWNE, mining engineer, of BROWNE & EDWARDS, of this city, has left for Michigan on professional business. Letters addressed to his New York office, given in another column, will reach him.

THERE are promising signs that the threatened strike in the iron trade in Pittsburg will be avoided by compromise between the men and the manufacturers. Our labor and wages notes have kept our readers informed on the claims of each side. The present scale of wages expires June 1st ; before that date, we trust that a definite and satisfactory arrangement may be arrived at. The condition and the prospects of the iron market give no encouragement to strikers. Wages are still declining ; but a fair scale, in which wages are equitably based on the selling prices of iron, should bring the best results to all concerned in this, as it has in the coal trade.

THE spring meeting (the eleventh) of the American Society of Mechanical Engineers will begin in Atlantic City on the evening of Tuesday, May 26th. The adjournment will take place on Friday. The following papers will be presented at the meeting : Notes on the Steam Stamp, F. G. COGGIN ; Belts as Grain Conveyors, T. W. HUGO ; Early Experiences in the Flow of Metals, W. E. WARD ; Technical Training at the Worcester Institute, G. I. ALDEN ; the Finance of Lubrication, R. H. THURSTON ; the Power Required to Drive Shafting, and its Cost, J. T. HENTHORN ; the Manufacture of Cotton-Seed Oil, E. W. THOMPSON ; the Oxidation of Metals, W. H. WEIGHTMAN ; Shell and Water-Tube Boilers, ALLAN STIRLING ; Apparatus for use in Testing Materials, G. C. HENNING ; the Torsion Balance, WILLIAM KENT ; Report on a Warm-Blast Apparatus for Steam-Boiler Furnaces, J. C. HOADLEY.

THE silver question is becoming more and more grave. The gold reserve of the government is steadily declining, and silver is taking its place. How long this can continue without producing a run on gold or a premium upon it, is simply a question of time. Whenever this does take place, gold will go out of circulation and silver will take its place. This would be a calamity whose far-reaching consequences can scarcely be computed or exaggerated, and its effect would by no means benefit our silver mines, as some seem to think.

The National Commercial Convention, now sitting in Atlanta, Georgia, voted against the continued coinage of silver. It was noticeable that the delegates of the Southern States, formerly in favor of the present silver coinage law, very generally oppose it now. The danger is becoming apparent to all business men, and the law will, no doubt, be changed at the next sitting of Congress in December. Let us hope the danger now hanging over us may not fall upon our already sorely tried industries before that date.

## THE GREAT FOREIGN COPPER MINES.

The influence of the decline in the price of copper upon the profits of the small number of mines that control the market for this metal is a subject of great interest ; for it shows approximately the limit of profitable price and the cost of production. This information concerning our great foreign rivals is still more interesting and important.

The following table we have condensed from the London *Mining World*, and have added the quotations of the shares of the companies at the beginning of the present month. Under the recent advance in Chili Bars, a corresponding advance has taken place in the shares :

| YEAR. | THARSIS. | | | RIO TINTO. | | | MASON & BARRY | | | PANULCILLO. | | | Price of copper. Chili Bars. | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Dividend per cent per annum. | 587,333 shares. Par £2. | | Dividend per cent per annum. | 325,000 shares. Par £10.* | | Dividend per cent per annum. | 185,164 shares. Par £10. | | Dividend per cent per annum. | 50,000 shares. Par £4. | | | |
| | | H. | L. | | H. | L. | | H. | L. | | H. | L. | H. | L. |
| 1879 | 16½ | 31¼ | 21⅛ | 5 | 10 | 2½ | .... | 1 | ... | 3⅛ | 5 1/16 | 1¼ | 66½ | 53¼ |
| 1880 | 20 | 34⅛ | 32½ | 8 | 19½ | 12⅛ | 25 | .... | .... | 9⅜ | 6 3/16 | 3⅜ | 73 | 56¼ |
| 1881 | 25 | 48¾ | 35 | 14 | 28⅝ | 19⅛ | 12½ | ... | .... | 10 | 7 | 4½ | 71 | 58⅛ |
| 1882 | 27½ | 45⅛ | 36 | 14 | 31⅜ | 22 | 12½ | 18⅜ | 15 1/16 | 15 | 7½ | 5¼ | 71 | 63¼ |
| 1883 | 27½ | 7¼ | 6 5/16 | 14 | 25⅜ | 18¼ | 12⅛ | 17⅛ | 13 | 12½ | 7 | 5⅝ | 64¾ | 58 |
| 1884 | 20 | 7 | 5⅜ | 8 | 21 | 12 | 8 | 13 9/16 | 8 | nil | 5⅜ | 2 1/16 | 58 | 47¼ |
| May, 1885 | .... | 4½ | 4 | .... | 8 | 7¾ | ... | 7¾ | 7½ | ..... | 2 | 1¼ | 44 | 43 |

The decline in profits is not, however, to be counted as varying in direct proportion to the price of copper ; for as prices decline, many economies are introduced and the cost of production per pound of copper declines. The production has been greatly increased by most of these companies, and a still heavier increase is promised.

The Rio Tinto is undoubtedly the greatest, though perhaps not the most important, factor in this question. The most important factor is the great company nearest the stopping limit.

This, the greatest mine in the world, is estimated, according to the president's address at a recent meeting of the stockholders, to have reserves of ore amounting to 150 million tons, and its dumps are stated to contain 46,000 tons of 2352 pounds, or 108 million pounds of copper. This stands the company in £6 7s. 6d. per ton, or about *one cent* per pound. The cost of extraction by the company's lixiviation process is small, and it has already extracted 33,000 tons of copper from these dumps. It is not, of course, to be expected that the entire contents will be saved ; but the process, though a slow one, extending over years, extracts finally a very high percentage of the metal, and at a low cost. The company mines about 5000 tons of ore daily, and this year has con-

* Rio Tinto has also £2,500,000 of 5 per cent mortgage bonds.

tracted to supply 400,000 tons to the acid-works in England, France, Germany, etc., and will treat at the mines over one million tons.

The average copper contents of the ore mined last year was 3·23 per cent by wet assay; but the company expects to receive from 2¼ to 2½ per cent on the 400,000 tons sold for the sulphur. This, at present prices, would amount to about 18s. per ton, and the sulphur is worth about as much more.

According to the president's report, the Rio Tinto expects to produce about 59,000,000 pounds of copper this year. Of this, 15,000 tons of 2352 pounds will be produced by the company at the mines, and about 10,000 tons will come from the 400,000 tons of pyrites already contracted to acid-works.

We glean from the president's address that the cost of the 15,000 tons of copper produced at the company's works, delivered in London, will be *about five and one half cents per pound.* This, however, does not include "interest and sinking fund expenses for bonds," nor "expenses of administration." We may add to the list of companies cited above the Cape Copper Company, which has 20,000 shares with £8 per share paid in, and which was quoted in London at the beginning of the present month at £30@£31.

The Calumet & Hecla, with its capital of $2,500,000, say £500,000 of capital, in $25 shares, worth $16 per share at the beginning of the month, holds its own well with its foreign rivals. This company expects to produce from 46,000,000 to 48,000,000 pounds of copper this year from a 4½ per cent ore yield.

The great Anaconda, with its immense deposit of ore, which is yielding on an average say 10 per cent, and with its magnificent works, will probably produce 35,000,000 pounds of copper this year.

## EDITORIAL CORRESPONDENCE.

### The Chattanooga Meeting of the American Institute of Mining Engineers.

The backwardness of the season this year has preserved for the Institute meeting the first freshness of spring; and this picturesque region, always lovely, never looked lovelier than now. Yesterday was a perfect day of sunny sky and balmy airs. To-day, it is what the Weather Bureau would call "clearing" weather; that is to say, you keep hoping it will clear, but it don't. It has drizzled and rained downright and held up; old Lookout has been wrapped in mist; and the only consolation of members as they arrived has been the reflection that the country needs a real "growing rain." If it will give way to-morrow to fair weather for the Tennessee River trip, every body will be grateful; but if we have to make that otherwise charming sail to South Pittsburg in an atmosphere that makes far things invisible and near things sticky—then we shall still be jolly, as the Institute knows how to be under all manner of difficulties. At this hour—after the opening session—the weather continues "clearing," and it is not clear whether it will be clear or not.

The opening session was successful in spite of meteorological drawbacks. General WILDER'S welcoming address was both cordial and instructive; and President BAYLES'S exposition of the situation with regard to iron-making in the South commanded, as it deserved, the thoughtful attention of the iron-masters. It certainly contains much comfort for those who are anchored with their capital in Northern States, and who have been led to fear that Southern competition was going to wipe them out entirely.

The number and the high standing of the Northern iron-masters attending this meeting indicate the keen interest with which they are regarding the new developments in the South. In the minds of some, the case already presents the alternative of a withdrawal from the business or a transfer of capital and plant to these new and promising fields. But while they will find much to admire and something to envy in this region of cheap materials, I think the wise heads among them will return with the conviction that the South is still a good way from taking possession of Northern markets.

Mr. BOWRON'S paper on the Sequachee Valley was partly geological and partly metallurgical. Under the former head, he forcibly controverted certain views of the history of the Cumberland Mountains and adjacent valleys, which have had the high sanction of Professor LESLEY'S name. In the latter part, he went into details of ore, coal, and furnace-working, such as seem to have taken possession of this meeting thus far. The air is full of them. Every body is talking blast-furnace or Clapp-Griffith; and other subjects than iron, steel, and coal will probably get "read by title" mainly.

Yet Mr. BOYD'S paper on the utilization of the copper and iron sulphides of the Virginia and Tennessee belt raised a question of great importance to the South, and one which does not fail to attract attention, as is proved by the immense volume of the agricultural phosphate business. This paper does not treat the subject exhaustively. It does little more than suggest the feasibility of employing the Ducktown and similar deposits for the manufacture of sulphuric acid, to which the phosphates shall be brought. In spite of the favorable conditions for such a transportation pointed out by Mr. BOYD, it seems as if the carrying of the acid to the phosphates would be the cheaper plan—that is, unless some of the by-products to which he refers can be made more profitable at the localities of the ore-deposits. The question thus raised is complicated, and can not be settled in a general discussion. *

CHATTANOOGA, TENN., May 19.

## CORRESPONDENCE.

[We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested.
All letters should be addressed to the MANAGING EDITOR.
We do not hold ourselves responsible for the opinions expressed by our correspondents.]

### Corliss Valve Gearing.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Can any of your readers inform me whether the above has ever been applied to engines for colliery winding purposes, and if so, with what results—beneficial or otherwise? H. W. H.

### Chili Bars and Lake Copper.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: In your last issue (May 16th), I see an article, "Copper Market Report of S. Raunheim," in which a statement is made to the following effect: "It is remarkable that a lot of Lake copper was sold in London at £55 two weeks ago, while Chili Bars were held at £43½, equal to a difference of £11½."

I fail to see this difference of £11½, since Chili Bars are not refined copper, and are only sold for refining. The average Chili Bars contain about 95 per cent of copper. The £11½ difference between Lake copper and Chili Bars would be considerably decreased by the refining charges and by the 5 per cent or so of their weight that is not copper. Chili Bars frequently contain no more than 90 per cent copper.

NEW YORK, May 19. HENRY W. EDWARDS.

### Civil vs. Military Engineers.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: Since "Observer" has again quoted the blast at Glendon as an awful example of incompetence in one U. S. Engineer, it may not be impertinent for me to state that Captain Raymond's responsibility in the matter was of the slightest.

He was *not* employed as an expert, and first visited us a few weeks (four, I think) before we fired the blast; but even at that late day, I thought, and still think, that we profited greatly by the friendly interest he manifested in our work, especially by the many practical hints that his experience at Lime Point enabled him to give us.

"Observer's" opinion is, that by using 16,000 pounds of powder, or twice what Captain Raymond considered as sufficient, the "efficiency" "would have been increased one fourth." I do not know how extensive "Observer's" knowledge may be in this particular instance, nor exactly what he means by "efficiency;" but so far as the quantity of rock thrown down is concerned, I am satisfied, for my part, in the light of an examination of the sites of the chambers after the loose rock was removed (long after Mr. Clark's paper was written), that it would have been very little increased, if at all, by the use of even very much heavier charges, and judging by the results of several blasts since made, that decidedly less would have done quite as much as the 12,000 pounds that we used.

GLENDON IRON-WORKS, EASTON, PA., May 20. F. FIRMSTONE.

EDITOR ENGINEERING AND MINING JOURNAL:

SIR: The courtesy of your columns has been extended to me so liberally that I feel bound to assure you of my resolution not to abuse it by the prosecution of an interminable controversy. I began by endeavoring to clear the ground of the misrepresentations which had been sown broadcast upon it. Having done this, I shall not go over the same ground again, to cut down brambles and pull up weeds which have appeared since the first clearing. I don't intend to *cultivate* this question; all I want is to get (and give my readers) a fair look at it.

In this preliminary work, I may have appeared to be wholly the champion, and not at all the critic, of the military engineers. The present letter will, perhaps, dispel that illusion, since it will deal with an aspect of the question not yet presented, and will involve a severe condemnation of the Engineer Department.

The whole question at issue is threefold: 1. Is the present system working well? 2. If not, should it be improved or abolished? 3. Whether it is working well or not, is a better system proposed?

Now the advocates of a change have made thus far the great blunder of denouncing the present system as bad in practice; and they have assaulted it, moreover, without knowledge or discipline or ammunition. A victory over such assailants, and at an outlying point of the works, is not matter for special boasting; and it does not settle the main question.

I propose now to show that the system of placing public works in charge of military engineers is in itself right and necessary, and hence, that any change which may be proved advisable should be an improvement of that system.

Few persons will deny that the United States, in view of the small size of its standing army, should maintain, as an indispensable element of national defense, an active, efficient, and sufficiently numerous corps of military engineers to supply, in case of need, that which the enthusiasm of volunteers can not supply, under the conditions of modern warfare—the necessary knowledge and training to make courage and patriotism instantly effective. This is true also of other "staff" departments, such as the Ordnance; but I am dealing just now with the Engineers only. Every student of military matters knows that we can improvise an army, and that a little experience under competent leadership will make it an army of veterans. What we can not improvise is a staff; and this, together

with certain kinds of war material, we ought to maintain in time of peace.

### A WAR DEPARTMENT MAP OF THE COUNTRY.

Now, the full efficiency of our army engineers requires that they shall be familiar with the country they may have to defend. They ought to know its topography, its rivers and harbors, and all those conditions which will be involved in its occupation as a theater of military operations. General Sherman once declared that, in resolving upon his famous "march to the sea," he relied upon a personal knowledge of every stream and hill on the route, gained in his work, as a young officer, many years before. It was a piece of great good luck that its commander had that knowledge; but we can not fail to see that any commander in his position ought to have had it—not necessarily from his individual experience, but from thorough surveys and maps previously made by the War Department. Every column of our troops operating on our soil ought to have both a map showing the ground and a staff officer knowing it. In a word, we ought to know our own country at least as well as the Germans knew France in 1870.

But we find the strange spectacle presented in the United States, alone among great powers, that the War Department of the government has nothing to do with the mapping of the country. For this unfortunate state of affairs, the Engineer Department is, in my opinion, largely to blame. At the close of the war, when the country was entering upon its new and wonderful era of progress, this department utterly failed to grasp the situation and to perceive what it required. The Pacific Railroad surveys had been made by army engineers. Civilians were not so anxious in those days as they afterward became to run lines through the Indian country. And if, in 1865 or a year or two later, the Chief of Engineers had prepared, as he ought to have done, a comprehensive and thorough plan for the construction by the War Department of a map of the country, there would have been no serious opposition.

In my judgment, this would have been the only valid, constitutional ground upon which such a work could have been carried out over the whole country by the federal government. Surveys of the public domain, to facilitate its settlement and sale, are constitutional; but spending the money of New York and Massachusetts on a map of Florida or Louisiana could scarcely be justified, except by reason of its relations to the national defense. A few years ago, this view was predominant. I am aware that of late it has fallen into disuse, if not disfavor; the survey of the public lands has become, by gradual encroachment, the geological, botanical, zoological, and ethnological survey of the States as well; the survey of the coast, for the benefit of commerce, has become the geodetic survey of the interior, for the benefit of science, and includes even the publication of papers on "the logic of relations" by distinguished high-mathematicians. But I can not help feeling that the old view was the true one, and that the real "logic of relations" in this case was the opposite of the logic adopted. It is probably too late to repair the error; but to indicate it may not be useless.

What the Engineer Department really did at the juncture referred to was substantially nothing at all. Mr. Clarence King, with the consent of that department, and practically without censorship or control, organized and carried out his survey of the 100th parallel, securing every year from Congress by his own efforts the necessary appropriation. A young lieutenant, Wheeler, began and gradually increased a series of reconnoissances in the West until he, too, was at the head of a "survey." Hayden, and Powell, and others, in the same way, lobbying for appropriations in the winter to support their field-work in the summer, grew to even greater prominence. Those were halcyon days for science! But when even the boundless West was not big enough to accommodate these rival expeditions, and they began to travel over one another's ground; when Hayden's friends declared that Wheeler's topography was not good enough for him to paint his geology on, and Wheeler's friends retorted in terms highly uncomplimentary to Hayden's fossils, the "halcyon" days became "vociferous;" and a struggle ensued at Washington which ultimately led to the removal of the geographical and geological surveys from the War Department altogether.

The "logic of relations" was thereby reversed. It is a familiar story in many of our States. A "geological survey" is started; and presently the chief geologist declares that he must have a good map as a prerequisite, and that there is no decent map for his purposes in existence. Therefore he must start also a topographical survey, which was not in the original bargain. Before the topographical survey is done, the Legislature, in its ignorance and impatience, stops the whole thing. At Washington, the matter did not end thus; the geological survey was made a separate Bureau in the Interior Department; the military engineers were left out in the cold; but, after all, the matter did not receive, as it might have done at that time, a complete and final solution.

### THE MISTAKE OF THE ENGINEER DEPARTMENT.

In all this dispute, the Engineer Department gave to Wheeler, its apparent representative, a lukewarm support. He was left to fight, and practically to lose, his own battle. One reason, I fancy, was the fact that Wheeler was by no means the chosen representative of the Engineer Department. If that department had done its duty, and the work of mapping the country had been properly and deliberately assigned to it, other officers and a different system would have been employed from the beginning; and bright, active young lieutenants like Wheeler would have been in their true places as subordinates. Wheeler's work shows plainly his own progress with increased experience and means; and it is of unequal value. The same is true of Hayden's, much of which is poor stuff and much very good indeed. As a means of training for these gentlemen and their assistants, the Western surveys were doubtless excellent. But no candid critic can fail to see that such sporadic and chaotic competition of individual ambitions was not an adequate substitute for a comprehensive, organized, and officially controlled institution.

The Engineer Department professed to be relieved when it lost the surveys altogether. It had allowed its subordinates to draw it gradually into a false position, and it was glad to get out. That estimable gentleman, brilliant commander, and able engineer, General Humphreys, the chief of the corps, said he didn't want that work. But in this he did wrong. He ought to have wanted it, demanded it, got it, and organized it long before. I would not speak harshly of one to whom, during his lifetime, I was indebted for more than one kindness, and for whom I entertained a sincere personal regard; but I believe that the failure of General Humphreys to comprehend the mission and opportunity of his corps and the true interest of the country in this particular was most unfortunate. It was, let us hope, the last legacy of mischief from the incorporation of the "Topogs" with the Corps of Engineers.

Well, for good or evil, that question is probably settled, and the only remaining occupations, in time of peace, which can be relied upon to train for effective service in war our military engineers, are the construction of permanent defenses and the improvements of rivers and harbors. The former purely military constructions are not enough to occupy a corps of such size as we ought to maintain. From works of the latter class I have often heard army engineers declare that they would be glad to be relieved. But I don't care whether they would be glad or not; I am not thinking at all of their wishes or their interests, but of the needs of the country. And I know very well that the upshot of all these attempts to diminish the field of occupation for army engineers would be (if they succeeded) the final destruction of the corps. No doubt my army friends would meet their fate with dignity. It would not really arrive in their time; and it is not hard to exhibit a calm pessimism about disasters which are going to reach posterity. For the present members of the corps, it would be pleasant enough, perhaps, to be relieved from civilian assistants and civilian assailants, devote themselves to purely "military" matters, write essays, sit on courts-martial, and draw pay. They are mortals; and mortals are not beyond the temptations of sinecures.

Yet I may do them injustice. The quiet pride with which they discharge carefully the duty commanded, and no more, and abstain from volunteering either advice or service, is not necessarily indolence or indifference. Whatever it is, however, I, who am not an army engineer, do not share it. As a citizen of the United States, I wish my country to maintain that corps strong in numbers, strong in ability, strong in familiarity with the country's needs and resources, and with practical work in their development. I wish that corps to be kept busy at work which shall both maintain its efficiency and take away from demagogues all pretext for its diminution or abolition; and I wish all this without any reference to the wishes which may be entertained by the members of the corps themselves.

### A GENERAL PLAN WANTED.

What we want, first of all, in connection with our public works, is some general plan and measure as to the amount of such works. A dozen million dollars one year, and nothing the next—nobody but lobbyists can call that wise. Let us know about how much of this sort of thing there is to be; and then let us have a corps of engineers that can take charge of it—*the more entirely and completely the better.* If men want employment and promotion on such works, let them go through the prescribed door to get it by submitting to the preliminary training of West Point and the School of Practice. The proposal that there shall be a mixture of civil and military engineers; that the civilians shall be promoted like the others, and shall upon merit duly shown (or favor duly obtained) even outrank their military associates, is scarcely worthy of serious discussion. It would not be practicable, if the civilian assistants were all in point of ability and fitness that they have been asserted to be.

This reminds me to mention, in conclusion, that I have made an interesting discovery with regard to the civilian assistants employed by the Engineer Department. I had naturally supposed them to be brilliant but wronged graduates of those American schools, the superiority of which to West Point is vehemently though vaguely declared by "C. U. E." But I find that this is not the case. My statistics are not complete; but they indicate, so far as they go, that the overwhelming majority of these civilian assistants are foreigners! I don't know what "C. U. E." will say to this circumstance. It will probably surprise him more than it did me; since, to tell the truth, I had a slight suspicion of it beforehand. But it ought to reassure him in one respect. He need not fear that a controversy can become too tragically bitter for his delicate palate, in which such bits of comic sweetness keep bobbing to the surface.

SPECTATOR.

## AMERICAN INSTITUTE OF MINING ENGINEERS—CHATTANOOGA MEETING.

The opening session of the meeting was held at the hall of the Iron, Coal, and Manufacturers' Association on Tuesday evening, May 19th. The meeting was called to order by Mr. H. S. Chamberlain, Chairman of the Local Committee, who introduced Gen. John T. Wilder, the pioneer of the iron industry of Chattanooga. General Wilder welcomed the Institute in cordial style, and indulged in interesting reminiscences of the early days of the industrial development of the South, almost immediately after the war. His remarks were illustrated by an excellent map, upon which he traced the geographical features which combine to constitute the great natural advantages of this region for the manufacture of iron. General Wilder's graphic and often humorous exposition evoked alternate applause and laughter.

President Bayles, replying on behalf of the Institute, paid a felicitous tribute to the rapid growth of Chattanooga, and expressed the pleasure with which, after seven years of such progress, the Institute met for the second time in this city; after which he delivered the presidential address, as follows:

### PRESIDENT'S ADDRESS.

GENTLEMEN OF THE INSTITUTE: The very interesting and remarkable development of iron manufacture in the South since our meeting in this city seven years ago suggests some thoughts that seem to me appropriate to the time and place, as a prelude to the more formal business that awaits our attention. I shall consider briefly some of the aspects of Southern industrial progress as they present themselves to my mind. As my views are derived largely from personal observation and inquiry, it is but fair to say that they are more likely to be mistaken than if gleaned from the writings of better authorities, and collated for your information. I desire, therefore, that what I shall say be as much as possible divested of the character of a formal *ex-officio* utterance. If the Institute assumes no responsibility for the views expressed by its members in papers and

discussions, still less has it need to assume responsibility for the views expressed in addresses from the chair.

In the following table, prepared from official sources, is shown the iron production of what is known as the Chattanooga District, including Southeastern Tennessee, Georgia, and Alabama, from 1878, the year of our first meeting in the South, to and including 1884:

| | Bituminous. | | Charcoal. | | Total. | |
|---|---|---|---|---|---|---|
| | Furnaces. | Tons. | Furnaces. | Tons. | Furnaces. | Tons. |
| 1878 | 9 | 48,469 | 18 | 26,496 | 27 | 74,965 |
| 1879 | 12 | 67,998 | 19 | 36,124 | 31 | 104,122 |
| 1880 | 13 | 113,695 | 18 | 45,014 | 31 | 158,709 |
| 1881 | 13 | 146,220 | 19 | 57,625 | 32 | 203,845 |
| 1882 | 13 | 184,090 | 15 | 71,106 | 28 | 255,196 |
| 1883 | 18 | 246,063 | 15 | 70,430 | 33 | 316,493 |
| 1884 | 19 | 279,047 | 18 | 69,063 | 37 | 348,110 |

Total annual capacity in 1872, say 50,000 net tons, an average of 3125 tons per furnace. Total annual capacity in 1884, 565,000 net tons, an average of 15,300 tons per furnace.

The pig-iron production of the territory south of Pennsylvania and Ohio, exclusive of Missouri, for five years ended with 1884 is shown in the following table:

| States. | Net tons. | | | | |
|---|---|---|---|---|---|
| | 1880. | 1881. | 1882. | 1883. | 1884. |
| Alabama | 77,190 | 98,081 | 112,765 | 172,465 | 189,664 |
| Virginia | 29,934 | 83,711 | 87,731 | 152,907 | 157,483 |
| Tennessee | 70,873 | 87,406 | 137,602 | 133,963 | 134,597 |
| West Virginia | 70,338 | 66,409 | 73,220 | 88,398 | 55,231 |
| Kentucky | 57,708 | 45,973 | 66,522 | 54,629 | 45,052 |
| Georgia | 27,321 | 37,404 | 42,440 | 45,364 | 42,655 |
| Maryland | 61,437 | 48,756 | 54,524 | 49,153 | 27,242 |
| Texas | 2,500 | 3,000 | 1,321 | 2,381 | 5,140 |
| North Carolina | ..... | 800 | 1,150 | ..... | 435 |
| Total | 397,301 | 471,540 | 577,275 | 699,260 | 657,599 |

The coal production of Georgia, Alabama, and Tennessee was 144,418 tons in 1870 and, approximately, 3,400,000 tons in 1884. For the entire South, it was 3,192,300 in 1870 and 10,844,000 in 1884.

The progress of the South is not, however, confined to mining and iron making. . . . .

In 1879, the assessed value of property in the South was $2,184,000,000; in 1884, it was $2,980,000,000, an increase of $800,000,000. In 1884, the Charleston, S. C., *News and Courier* made a careful and exhaustive investigation into the manufacturing and mining interests of South Carolina, taking up every section of every county in the State. According to this report, which has everywhere been accepted as quite trustworthy, the aggregate value of the products of all manufactures in that State in 1883 was $32,324,404, and of mines $2,440,000, against $16,738,008 and $1,180,805 as the value of the products of manufactures and mines, respectively, during the census year 1879–80. And yet South Carolina has not made as much advance in these industries since 1880 as Virginia, North Carolina, Georgia, Alabama, Kentucky, or Tennessee. A complete census of the industrial interests of the South in 1885 would be a revelation.

It is not my purpose, however, to present even such statistics as are available relating to industrial development in the Southern States. In the few minutes at my command, I can consider only very briefly the economic aspects of iron-making in the South, especially in this district [Chattanooga], already of national importance as a center of production. The fact that the South has many and conspicuous natural advantages favorable to cheap and abundant iron production, will be conceded without argument. But one does not need to be a very close student of industrial statistics to discover that it is possible to overestimate the importance of natural advantages. The history of Great Britain—for the past quarter of a century largely dependent upon advantages acquired through superior commercial enterprise—illustrates this in a very striking manner. Elsewhere we find examples showing that, in spite of natural disadvantages so obvious that one may well wonder at the courage shown in beginnings made under such adverse circumstances, great industrial developments are possible, and that, with such seemingly artificial developments, the competition of natural advantages is attended with many discouragements.

In her wealth of contiguous ores and fuels, the South can justly claim such advantages as might be sought in vain almost any where else. That these advantages have told heavily in her favor, and with greater or less weight against less favored sections, one need but glance at our iron trade statistics to see. But, notwithstanding all that nature has done for the South, she has not forgotten the law of compensations, which may be traced in all her open-handed beneficence. Even here, the wheel of fortune does not turn in anti-friction bearings, and experience has alread shown that in the South, as elsewhere, nature has left a good deal to be done by skill and enterprise; that here, as elsewhere, the conditions of success must be attained by means very similar to those that are more obviously necessary where nature has been less generous in dispensing her favors. If we dismiss from mind all the sensational stories that from time to time have spread a more or less modified consternation among Northern iron-makers, we may safely count upon the assent of conservative Southern opinion to the statement that probably there has been very little profit realized in selling Southern irons for less than the admitted cost of competing Western and Northern irons in Western and Northern markets.

The question of the cost of pig-iron is one of first interest to every one identified with enterprises promotive of the development of the country. The elements that enter into the manufacture of pig-iron are so few, and the methods of its production are so generally known, that tabulated statements of cost are exceedingly common. . . . .

If we carefully examine the conditions existing in one of the most favored and promising districts of the South, we find that it is possible to exaggerate the local advantages without the intention of so doing. When the red fossil ores of Alabama were first used, they were taken from along the Red Mountain outcrop. They were easily and cheaply mined, and averaged nearly, if not quite, 50 per cent of metallic iron. In estimating the cost of producing iron from these ores, it was assumed that two tons of ore to the ton of iron would be needed, and that the ore at furnace would not cost more than 60 cents per ton. But of this surface ore, the quantity is comparatively limited. To secure a supply, mining below the surface is necessary, and as we go deeper, we find that the ore becomes harder and more difficult to mine, as well as leaner in iron, averaging only about 40 per cent. When operations began, a good miner could easily mine from 8 to 10 tons of the soft surface ore a day without explosives; but it requires a good hand to mine four tons of the hard ore in a day, even with a liberal use of 40 per cent dynamite. Consequently, instead of making a ton of iron with 2 tons of ore, costing about $1.20, it requires 2⅝ tons of ore, costing about $2.40 per ton of iron. For furnaces so situated that a railroad haul is necessary, 25 cents a ton must be added, bringing the cost of ore up to about $3 per ton of iron, or $1.80 more than the original estimates. There is plenty of ore in Red Mountain, but it is not all available. Its quality varies as much as its quantity. Much of it is so siliceous as to have no present value. According to the best information I can gain, the red fossil ores used at all the coke furnaces in Alabama carry an average of 17 per cent silica, and the percentage increases as greater depths are reached. The surface ore contains but little lime, while the hard ore contains from 15 to 30 per cent. In this variation is found the explanation of much of the difficulty experienced by furnace managers in Alabama. The greatest care is necessary to keep the surface ore and the hard ore separate, and the burden must be changed frequently. Hence lime sets and scaffolds are very common, and the time lost by reason of these almost unavoidable accidents would turn a Northern furnace manager's hair gray in a very brief period.

The fuel supply for this favored district is from the Pratt seam. When free from slate and dirt, the coal is good and produces a lustrous, medium coke, but in the shape in which it mostly reaches the furnace, the coke is not a first-class furnace fuel, and considerably more than the originally estimated quantity is needed to produce a ton of iron. It has been stated that iron has been made with 1½ tons of this coke, but I do not think the statement has been substantiated. It probably takes 1¾ tons, to which must be added fuel burned under boilers and for other purposes, bringing the average up to two tons of coke per ton of iron.

Between the ore on one side and the coal on the other lies plenty of limestone—conveniently near, but, unfortunately, most inconveniently placed. In fact, the whole valley is full of limestone, much of it of superior quality. It is not, however, available for use in the furnaces of the district we are considering. It is all standing on edge, and the limestone used is obtained from a distance of thirty miles from the center of iron production, and is delivered by rail, costing 85 cents per ton of 2240 pounds.

The labor question is a troublesome one. The supply is abundant, but it is ignorant and unintelligent. Common labor commands $1 a day, and other labor is paid in proportion; but constant and strict supervision is necessary. The cost of labor at furnaces varies, I am told, from $2 to $2.50 per ton of iron. Perhaps $2.50 would be a fair average for labor and salaries.

Taking the facts as they are, I have the best and most intelligent, as well as the most conservative, local authority for calculating the cost of iron-making at the point where the natural advantages seem to be greatest, as follows:

| | |
|---|---|
| 2 3-5 tons ore at $1.25 | $3.00 |
| 2 tons coke at $2.50 | 5.00 |
| 1 ton limestone | .85 |
| Salaries and labor | 2.50 |
| Interest and expenses | .50 |
| Repairs and replacement | .50 |
| Total | $12.35 |

In this table, the average cost of coke is underestimated; $2.75 per ton would be nearer correct than $2.50, waste included.

I am aware that, in calculating cost, interest is usually omitted, but, in the judgment of all skilled accountants, interest is as much a part of cost as materials, even when it does not have to be paid for the use of money borrowed on bonds or paper. Capital that does not earn interest is not invested, but sunk or locked up.

The average cost of getting this iron to market, including selling commissions, may be placed at $4. There is nothing in this total of say $16, to keep within safe bounds, to discourage the Southern iron-maker, nor to alarm the producers of other sections. Pig-iron of satisfactory quality can be made as cheaply at a great many favorable points North and West.

Since these figures were prepared, I have had opportunity to examine critically the remarkable tables in the report on the "Consumption of Iron Ore and Fuel in the Production of Iron and Steel in 1884," by Mr. George W. Cope, Secretary of the American Iron and Steel Association. The correctness of these figures is not likely to be impeached, as they are compiled from the best obtainable data. They show that in Pennsylvania the average consumption of ore per ton of iron produced is 1·83 tons, which gives 54·7 per cent as the average yield in metallic iron. For the whole United States, the average is 1·87 tons of ore per ton of iron produced, giving an average of 53·4 per cent of iron. For Tennessee, Georgia, Alabama, and North Carolina, the average consumption of ore per ton of iron is 2·31·5 tons, averaging 43·2 per cent iron. From this, it appears that Southern ores yield in the furnace 10·2 per cent less iron than the average of the ores used in all the furnaces of the country, and that it requires ·44 ton more ore than the national average to make a ton of iron in the South. The fuel comparison is equally surprising. The general average consumption of coke per ton of iron is 1·31 tons. This figure is reached by making due allowance for the coke equivalent of raw bituminous coal used, which in Mr. Cope's table is counted as coke. In Tennessee, Georgia, Alabama, and North Carolina, the average coke consumption per ton of iron is 1·48 tons. Recapitulating these figures, we find that in so much of the South as includes Tennessee, Georgia, Alabama, and North Carolina, the ore runs 10·2 per cent in iron below the average of ores used in the United States, that ·44 ton more of ore is needed to the ton of iron made, and that the coke consumption to the ton of product is ·39 ton greater. What, then, it may be asked, becomes of natural Southern advantages? The answer is, that it is found in the contiguity of ore and fuel. The average of ores and fuels together per ton of iron produced is 3¼ tons for the whole country. If we knew the average haul-

per ton of material charged, we should know just how far the advantage of the Southern furnaces in this item of cost offsets the disadvantages noted. Probably a balancing of the two sides of the account would show a credit for the Southern furnaces large enough to fairly offset, at least, the heavier transportation charges borne by their product in reaching a market. I am sorry that these figures are not available, as they are the items that belong on the credit side of the Southern account. I do not dare to risk any speculations concerning them without better data than I now have of average haul of materials and product, and average cost of transportation per mile.

Not being a maker of pig-iron, and having no local interests to serve, I do not hesitate to give it as my opinion that, while the South will undoubtedly increase in importance as a source of pig-iron supply, it is not destined to monopolize the business of iron-making. The sharp competition of Southern irons in Northern and Western markets is already causing the conditions so to change as to effect an equalization of advantages. Ores, coal, and labor are cheapening where the demand for them is lessened by causes discouraging production, and they must advance in value where the demand for them is stimulated. The cost of freights will always be a protection to those making iron nearer the great centers of consumption, and will continue to represent at least the normal average advantage of the Southern furnaces in first cost. That there are many points in the North and West that are quite as advantageous for iron-making as any in the South, all things considered, I fully believe. The only significance of this fact, however, as bearing upon the question of the future of the Southern iron industry is that, if its production of iron is based upon the consumptive requirements of the rest of the country, a good deal of its furnace capacity may be expected to stand idle much of the time.

The hope of the South is in a larger local consumption of iron. Most of its pig-iron product now pays freight to Northern rolling-mills and foundries, and such part of it as is needed for Southern use pays a second transportation charge when returned in manufactured forms. In this respect, Southern industrial development has not been uniform. Its permanent prosperity will be found in rolling-mills, machine-shops, foundries, and manufacturing industries to consume its pig-iron and convert it into forms that which will bear transportation better than raw materials. It is repeating the experience of the West, and let us hope that, like the West, its prosperity will be built upon the substantial foundation of diversified industries.

The first paper was then read by Mr. W. B. Bowron, of South Pittsburg, Tenn., on the Minerals of the Sequachee Valley. As this district was to be traversed on the following day, the account of its geology and mineral resources given by Mr. Bowron was listened to with special interest.

The next paper was read by F. L. Garrison, of Philadelphia, on the Microscopic Structure of Iron and Steel. This paper was accompanied with excellent micro-photographic illustrations, showing the structure of cast and wrought-iron, steel, etc.

The next paper was read by C. R. Boyd, of Wytheville, Va., on the Copper and Iron Sulphides of Virginia, North Carolina, and Tennessee, and their Utilization in the Manufacture of Super-Phosphates, etc.

After announcements by the Secretary and the Local Committee, the session was adjourned.

## THE COPPER MINES OF BUTTE, MONTANA—THE OUTLOOK FOR 1885.

Written for the Engineering and Mining Journal.

The Parrot Company started up its works this week. The Montana Copper Company is running all its furnaces. As it proposes, however, to sink the main shafts both of the Colusa and the West Colusa this summer, it is doubtful whether it can supply all its furnaces unless it resorts to purchased ore. It is now making silvered matte entirely, which gives the company an extra profit over its competitors in this camp. The Anaconda, it is understood, made close on to 100 tons of 65 per cent matte daily for the months of March and April. Several of the furnaces have been stopped, however, this month, and their output will probably for the future not exceed 2000 tons of matte a month. Improved arrangements are making for the treatment of the slimes that are now running to waste; but work on the new concentrating plant has been suspended. The management has apparently come to the conclusion that it is unwise to exhaust the mine for the small profits obtainable at present prices.

### THE COPPER MARKET.

The Butte product seems to have exercised such a depressing effect on the copper markets of the world that it may be as well to investigate the matter a little under present conditions, and see whether there is any cause for the panicky feeling prevalent.

The output of the camp for 1884 was about 27,000 tons of copper.* In the summer and fall, estimates made by the best authorities in the camp agreed that the output for the year would be from 29,000 to 30,000 tons; but the results fell short, owing to the stoppage of the Liquidator and the delay in the completion of the Anaconda smelting-works.

At the same time, it appeared that the product for 1885 would reach the enormous amount of 50,000 tons, and had the mining companies carried out their programmes, it would hardly have fallen short of that amount. The Anaconda Company was expected to make 24,000 tons, and in the last two months has, as stated elsewhere, been producing at that rate. The Parrot was producing at the rate of 6000 tons; the Montana Company, 4000 tons; the Liquidator, 3000 tons; Clark's Colusa, about the same; the Bell and Colorado smelters, about 6000 tons; while, for the latter half of 1885, the Mountain View was expected to be a large producer.

Low prices for copper, high costs of production, and other causes have, however, changed all that. The Anaconda has reduced its output, and will probably not make more than from 16,000 to 17,000 tons, the whole of which will be required to fill existing contracts. The Parrot has lost three months, and is probably good for only 4000 tons. The Montana has lost two months already, and, for reasons elsewhere suggested, is likely to produce less for the rest of the year, so that 2500 tons is a fair estimate for it. The Liquidator is still closed, and the owners do not talk of resuming. Clark's Colusa has still some contracts to fill, but is expected soon to reduce its output, and should not be counted at more than 2000 tons. The Bell's course is uncertain; but 4000 tons for that and the Colorado will be a fair estimate. The owner of the Mountain View has wisely determined not to break ore in the present state of the market, and will content himself with developing his property. Allowing, however, 1000 tons for this and other small producers, we have a total estimate of 30,000 tons for 1885, or only 3000 tons more than in 1884.

Of this 30,000 tons, more than one half—that of the Anaconda—is already contracted for, and its effect on prices has been discounted over and over again. A great portion of the Clark and Montana companies is also sold ahead, and its full effect allowed for. It would appear, therefore, that, as far as Butte is concerned, the copper market has already seen its worst days, and an upward tendency must soon exhibit itself.

It is a common argument that, as soon as prices show any improvement, the output will be increased and the market broken again. This is not likely to be the case, for two reasons. In the first place, margins are so extremely small now that a very considerable rise must take place to induce the investment of much capital in new works; and secondly, the mine-owners have received a lesson that will be very useful. Western miners who are in the habit of mining only for gold and silver have been accustomed to work out their mines in the quickest way possible (a policy for which much is to be said where the precious metals are concerned); but copper, they have found, can not be treated in this way. Copper, like iron and coal, is a strictly commercial metal, and the world will have no more of it than it can use. Consequently, there is reason to hope that the miners here will henceforth adopt a conservative plan and work their mines steadily from year to year in a way to make a fair profit for a long time.

MINER.

* The production of Montana in 1884, as estimated by Mr. C. Kirchhoff for the Bureau of Statistics, was 40,509,000 pounds = 20,250 tons.—EDITOR ENGINEERING AND MINING JOURNAL.

## MODERN AMERICAN METHODS OF COPPER SMELTING.*

By Edward D. Peters, Jr., M.E., M.D.

### CHAPTER IV.—CONTINUED.

An ore with 12 per cent sulphur, which is perhaps as low as can be thoroughly roasted in heaps without mixing a considerable quantity of fuel throughout with the rock, may well be piled up to a hight of 7 feet, while solid pyrites with a sulphur tenor of from 35 to 40 per cent should never be allowed to exceed 5 or 5½ feet, the measurement including only the ore, and not the layer of wood on which it rests. The best average hight for ordinary ore is six feet, under which circumstances it will burn 70 days; the time being correspondingly diminished or increased by ten days, if six inches be taken from, or added to, the above figures. The area of the heap has little influence on this time. The following table gives the result of the roasting of large quantities of various ores. In most of these cases, frequent sulphur assays were made of the ore under treatment; but in a few instances, the sulphur was estimated from a general knowledge of the material. The heaps were thoroughly covered and carefully watched, and the combustion was kept at the lowest point compatible with safety, the sole object being to obtain the most thorough possible roast, regardless of time or trouble.

This should be the universal practice; for although the grade of metal to be produced in the subsequent fusion may not demand such a thorough calcination, it is better to roast a certain portion of the stock thoroughly, and then reduce, or dilute, the matte to the required standard by the addition of raw ore. This lessens expenses in various ways. It costs but little more to roast an ore thoroughly than to do so partially; and the more completely the sulphur is eliminated from the roasted ore, the larger will be the proportion of raw ore that can be used in the charge; and consequently, the less will be the cost of calcining and the losses from fines of roasted ore. It is also very easy to keep the "pitch" or percentage of the matte produced at a proper point, when thoroughly oxidized stock is always at hand. These, and various other reasons that could be mentioned, are sufficient to refute the arguments of those who consider the addition of raw ore peculiarly injurious, and prefer an imperfect roasting of the entire stock.

LENGTH OF TIME CONSUMED IN BURNING HEAPS OF VARIOUS HIGHTS.

| Hight in feet. | Quality of ore. | Per cent in sulphur. | Per cent in copper. | No. of days burning. | No. of sample. |
|---|---|---|---|---|---|
| 5 | Pyrite | 39 | 6½ | 54 | No. 1 |
| 5 | Chalcopyrite, with little pyrite in quartz | 18 | 14·3 | 41 | " 2 |
| 5 | Bornite and pyrite | 31 | 21·4 | 53 | " 3 |
| 5½ | Same as No. 1 | 39 | 6½ | 66 | " 4 |
| 5½ | " " No. 2 | 18 | 14·3 | 50 | " 5 |
| 5½ | " " No. 3 | 31 | 21·4 | 65 | " 6 |
| 6 | " " No. 1 | 39 | 6½ | 72 | " 7 |
| 6 | " " No. 2 | 18† | 14·3 | 61 | " 8 |
| 6 | " " No. 3 | 31 | 21·4 | 74 | " 9 |
| 7 | " " No. 1, much matted | 39† | 6½ | 94 | " 10 |
| 7 | " " No. 3 | 31 | 21·4 | 86 | " 11 |
| 7½ | Copper glance and pyrite in quartz | 20† | 23·4 | 54 | " 12 |

The area of the heap is determined by the position and size of the ground at disposal, and the convenience of delivering the ore. Its width is limited by the distance to which the covering material can be conveniently thrown with a shovel, and by the room between the bents that support the track. Twenty-four feet in width by forty in length is a very convenient size, smaller heaps demanding considerably more labor and fuel to the ton of ore. With 36 feet between the bents, an ample border of 6 feet will be left on each side of the pile, for collecting the fines, wheeling the same wherever required, and fully securing the woodwork against all danger of fire. This is still further obviated by elevating the foundation sill from which the uprights arise upon a wall of slag-brick, three feet or more in hight. A pile of the dimensions referred to, 24 feet by 40 feet square, and 6 feet high, will contain about 240 tons of ordinary ore, and should be built in the following manner:

The corners of the rectangular space on which it is to be erected should be indicated by stakes, or, if the same size is to be permanently

* Copy-right, 1885, by the Scientific Publishing Company. † Estimated.

retained, by large stones, or, better, blocks of slags, imbedded in the ground. The sides of the area being indicated by lines drawn on the ground to guide the workman, the entire space should be covered evenly to a depth of four or six inches with fine ore from the spalling-shed. This layer of sulphides answers several purposes: in the first place, it prevents the baking and adhering to the ground of the coarser ore, which, especially when much matte is formed, sticks to the clayey soil to such an extent as to tear up and injure the foundation, besides mixing worthless dirt with the ore, and causing a loss of the latter when attempts at separation are made. It also forms a distinct boundary line between the worthless and valuable materials, and, when left undisturbed during two or three operations, becomes itself so thoroughly desulphurized that the upper half or more may be scraped up with shovels and added to the roasted ore, its place being filled by a fresh supply of fines. This operation completed, the fuel is next arranged by an experienced workman in a regular and systematic manner. The quality and size of the wood is a matter of some moment, and must be determined for each individual case, it being evident that that variety of fuel that yields the greatest amount of heat for the longest time possesses the highest money value, provided the ore is of such a nature as to bear the temperature produced without fusing. As most sulphide ores will not stand the heat generated by a thick bed of sound, dry, hard wood, it frequently happens that a cheaper variety answers the purpose better. The outside border of wood that corresponds to the edges of the heap should be of better quality, as no such degree of heat is attainable there as in the interior of the pile. Therefore a large proportion of the bed may be made up of old rails, logs, gnarled and knotted trunks that have defied wedge and beetle, and such sticks of cord-wood as are daily thrown out from wood-burning boilers and calcining-furnaces as too crooked and misshapen to be fitted for a contracted fire-place. Such miscellaneous fuel causes somewhat greater labor in arrangement; but whatever the material, it must be placed with such care and skill as to form a solid and sufficient bed, varying in depth from 8 to 14 inches according to the behavior of the ore. However rough and irregular the greater portion of the fuel at our disposal may be, enough cord-wood of even length and diameter should be selected to form a four-foot border around the entire heap and just within the side-lines of the area: for the even and regular kindling of the heap depends considerably upon the proper arrangement of this border. Sticks of cord-wood not larger than five inches in diameter should be laid side by side across both ends and sides of the area. Across this layer, small wood is again piled until this four-foot border has been built up to the hight of some ten inches, brushwood and chips being scattered over the surface to fill up all interstices, while canals six inches wide, filled with kindlings, are formed at intervals of eight or ten feet, leading from the outer air and communicating with the chimneys in the center line of the heap. The empty area within this encircling border is now filled with the poorer quality of fuel, all sticks laid parallel and with as much regularity as possible; to cover all cracks and interstices, that no ore may fall through the wood, and to cover over the draught-canals in such a manner that they shall be neither choked nor destroyed by the superincumbent load.*

The chimneys, which assist materially in rapidly and certainly kindling the entire heap, are formed of four worthless boards nailed lightly together in such a manner that two of the opposite sides stand some eight inches from the ground, thus leaving spaces that communicate with the draught-canals referred to, and toward which several of the latter converge. For a heap 40 feet in length, three such chimneys eight inches square will suffice. They should project at least two feet above the proposed upper surface of the structure, that no fragments of ore may accidentally enter the flue opening and destroy its draught. In certain localities, where even old boards are too valuable to be needlessly sacrificed, two or three medium-sized sticks of cord-wood may be wired together to form the chimney; or old pieces of sheet-iron, such as condemned jig-screens, worn-out corrugated roofing-iron, etc., may be so bent and wired as to form a permanent and sufficient passage, while this material will answer for several operations. The chimneys being placed in position, equidistant, and on the longitudinal center line of the bed of fuel, and held upright by temporary wooden supports, the heap is ready to receive the ore. This is brought in car-loads of 1500 or 2000 pounds from the spalling-shed, and weighed *en route* on track-scales. It is dumped on a portable wooden platform about eight feet square, to prevent the deranging of the wood from the fall of so heavy a mass of rock from a hight of ten feet or thereabout. The first few car-loads are heaped about the chimneys and the platform is changed from place to place as convenience demands, until the bed of wood is thoroughly protected by a thick layer of ore. The remainder of the process is a very simple operation. The cars of ore are dumped in turn over the entire area by a systematic shifting of the temporary pair of rails already described, and the heap formed into a shapely pyramid with sharp corners and an angle of inclination of some 42 degrees, or as steep as the ore will naturally lie without rolling. The main body of the structure is formed of the coarsest class of ore; the ragging is next placed upon the pile, forming a comparatively thick covering at the part nearest the ground, and gradually thinning out toward the top and on the upper surface. Its thickness depends on the amount available, and no fears need be entertained of its having an unfavorable influence on the calcination; for when carefully separated from the finest class, a heap formed entirely of ragging will give reasonably good results. The extreme outside edge of the ore, when all is in place, should not entirely cover the external border of wood. At least a foot of uncovered fuel should project beyond the layer of ragging, both to prevent the ore from sliding off its bed as well as to insure a thorough kindling of the outer covering of mineral. The amount of wood required properly to burn a heap of 240 tons of ore will vary greatly with the composition of the latter, standing in direct proportion to its sulphur contents, and especially to the amount of bisulphides present, but may, on the average, be estimated at 12 cords, or one cord of wood to 20 tons of ore. In smaller heaps, this proportion must be considerably increased.

The fine ore that is to form the external layer, and on which depends largely the success of the process, is seldom placed upon the heap until after it is fired. Perhaps the most judicious practice is to cover the sides of the pile with a very thin layer, scattering it evenly with a shovel, and leaving the upper surface, as well as a space eighteen inches broad at the bottom, uncovered; for if the fine ore is thrown carelessly upon the lower circumference of the pile, the draught is decidedly hampered and the fire stifled before getting fairly under way. For an average ore, an amount of fines equal to 10 per cent of its total weight is ample; of this, eight tons may be strewn lightly upon the sides of the heap, as just described, the remaining 16 tons—assuming the entire contents to be 240 tons—being arranged in small piles upon the empty space between the roast-heaps, where it is easily accessible to the shovel. The lighting should be done just as the day shift is quitting work, as the dense fumes of wood smoke, strongly saturated with pyroligneous acid and the various gaseous compounds of sulphur and arsenic, among which sulphureted hydrogen is always plainly distinguishable, are almost unbearable.

If possible, fine weather should be selected for this purpose; for although no rain, however violent, is capable of extinguishing a well-lighted roast-heap, it may still interfere greatly with kindling a new one, and is quite likely to cause subsequent irregularities in the course of the process. There are several different methods of firing a roast-heap—such as lighting it only on the leeward side, and letting the fire creep back against the wind; kindling it through the draught-chimneys, etc., each of which has its advocates among roasting foremen; but long-continued observation has shown that no advantage is gained by any of these irregular methods, and the most sensible and successful practice is to light it as quickly and thoroughly as possible by applying a handful of cotton-waste, saturated with coal oil, or a ladle of molten slag, to the kindling-wood at the mouth of each of the draught-canals, these being some six or eight in number, as already described. As the success of the entire operation depends principally on the management of the heap for the first few days after kindling, it will be necessary to study somewhat in detail the phenomena that it should normally exhibit during this critical period, always bearing in mind the impossibility of laying down any fixed rules that shall apply to all circumstances and to every variety of material.

*An excellent paper on heap roasting in Vermont, by Mr. William Glenn, may be found in the ENGINEERING AND MINING JOURNAL, issue of December 8th, 1883.

## A GREEK TUNNEL OF THE SIXTH CENTURY B.C.*

By Prof. A. C. Merriam, Ph.D.

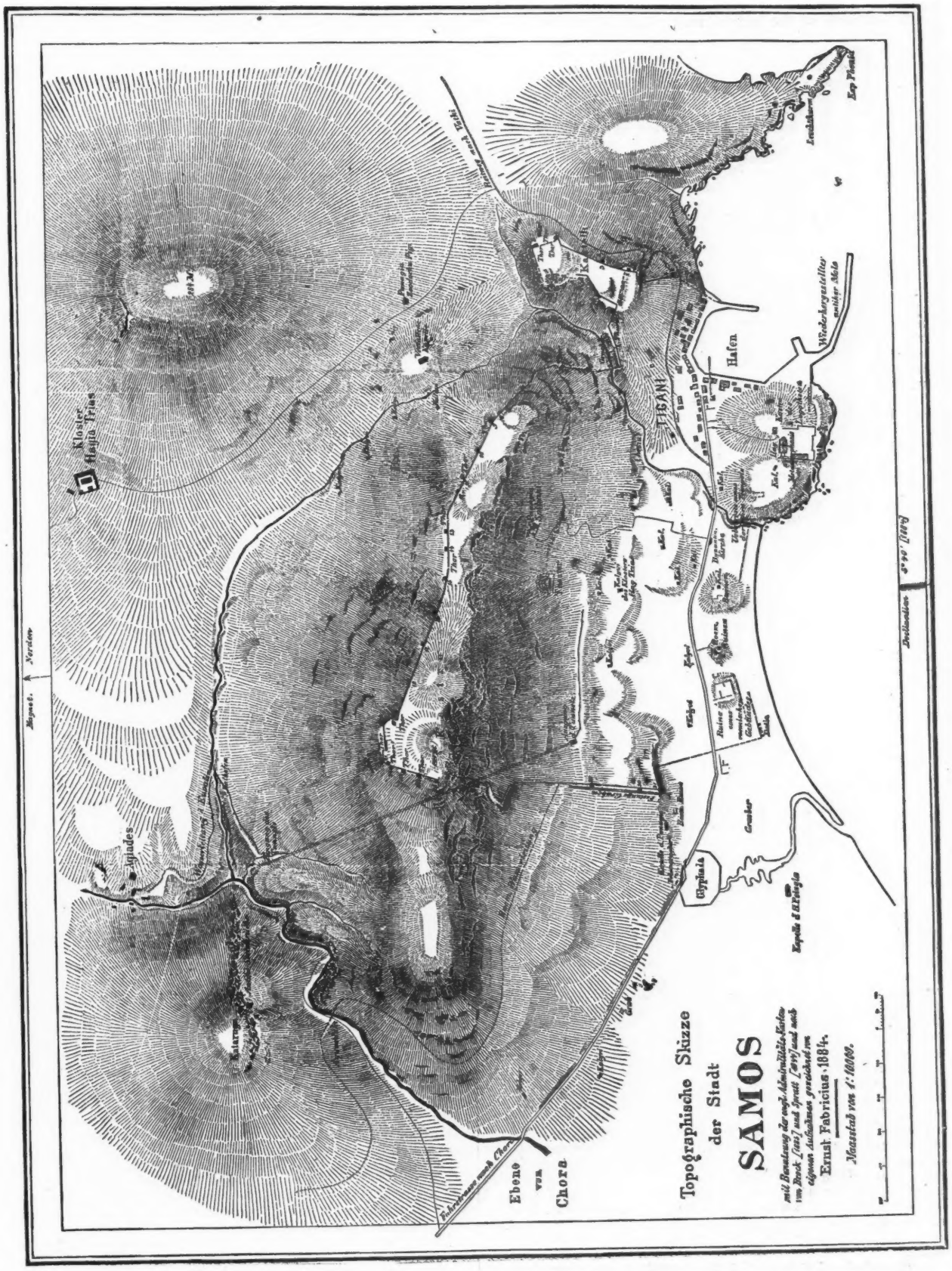
After relating the immortal story of Polycrates and his ring, and the fruitless siege of the city of Samos by the Lacedæmonians about 525 B.C., Herodotus pauses in the third book of his history to apologize for the space that he had given to Samos, and alleges as his reason that the Samians had constructed three of the greatest works existing among the Greeks—a tunnel through a mountain 900 feet high; a mole or breakwater in the harbor, 120 feet in depth and more than two furlongs (¼ mile) in extent; and the temple of Hera, the largest with which he was acquainted. The tunnel, however, excited in him the greatest wonder, and he gives the following particular description of it:

"The tunnel, beginning from below, runs through a mountain 150 *orgyiæ* in hight, and has an opening at both ends. The length of the tunnel is seven stadia (1294 m.), the hight and breadth, 8 feet (2·44 m.) each way. Through its whole length, another channel has been dug, 20 cubits deep and 3 feet wide, through which the water is conveyed by pipes into the city from a copious fountain. The engineer of the tunnel was Eupalinus of Megara."

No other ancient author describes this tunnel, and its location in the mountain remained unknown to modern scholars until 1882, when the aqueduct in the city was accidentally discovered by Kyrillos, the abbot of the neighboring cloister of Hagia Trias. At the depth of about six feet, he unearthed some stone slabs, on removing which he disclosed the ancient conduit sunk in the rock, and running parallel with the ridge above it, or almost due east and west. He followed the course of this channel westward by opening a series of pits at short intervals, till, as the channel approached the steep and rocky hight that dominates the western end of the city, it turned northward toward the base of the acclivity. Here it was found that the channel penetrated the mountain-side by a tunnel. As the only copious spring existing in the region adjacent to the northern side of the mountain was under one of three chapels lying close together, called the Hagiades, it was assumed that this was the source mentioned by Herodotus, and the abbot conceived the idea that the channel might be opened throughout its whole length, repaired, and used for the conveyance of water to the village now occupying a portion of the old site of Samos. The governor of the island became interested in the project, and work was begun upon it in May with fifty men, and continued for five months under the direction of the abbot. During this time, the conduit connecting the source with the north end of the tunnel was cleared out, about one half of the tunnel itself, and several hundred meters of the main in the city. At this point, their means were exhausted, the work was abandoned, and it has not since been resumed. During the progress of the work, George Dennis paid a flying visit to the island, and wrote a short account of the discovery to the London *Academy;* and last winter, the German Archæological Institute of Athens sent one of its members, Ernst Fabricius, to make a detailed survey of the whole work. The excellent report of his investigations has been published in the *Mittheilungen des Deutschen Archæologischen Institutes zu Athen* for 1884, pp. 163–192, and from this the following account is taken, together with the map of Samos and the drawings representing the various parts of the aqueduct.

As the whole structure of the aqueduct was determined by the configuration of the city and its surroundings, it will be well to devote a few words to a survey of these features. The ancient city lay for the most part on the lower ground along the sea, facing the south, but a part was built higher up on the slope, as far at least as the point where the theater is laid down on the map. Advancing farther up the slope, the mountain becomes so steep that habitation was excluded, and it is only with great difficulty that one can climb to the summit, which is 228 m. above the sea-level. Here the ancient wall is reached, remains

*School of Mines Quarterly, March, 1885.


Topographische Skizze
der Stadt
SAMOS
Ernst Fabricius. 1884.
Maasstab von 1: 10000.
Hafen
Ebene von Chora
Kloster Hagia Trias
Agiades
Nordost
Nordwest
Südwest
Südost

of which, especially of the towers, are still to be traced. Near the western extremity of the hight, at tower 25, the wall turns to the south and descends to the sea. The mountain, now called Kastro, slopes to the north from the wall, less abruptly than on the southern side, but is still difficult to climb. From the northeastern side, near a ruined chapel, a small stream will be seen on the map to head. Running in a northwesterly direction, through a ravine that skirts the foot of the declivity, it finally turns to the west, and at a point just north of the entrance to the tunnel joins a much stronger creek descending through a ravine from the north, and then the combined streams pass off to the southwest. On the left bank of the larger creek, about 400 m. north of the foot of the Kastro, under the chapel of St. John, is the copious spring mentioned by Herodotus. The water might have been conveyed from this source around the west end of the mountain into the city; but it would have been necessary to cut through perpendicular rocks of great hight, and it would probably have been impossible to conceal the structure from an enemy beleaguering the city. This, added to the imperial spirit of Polycrates, determined the construction of the tunnel straight into the city itself, through the mountain, and at a point of the city, too, namely, the western extremity, high up on the declivity, whence the main could be run quite through the town to the east, with small pipes leading off at convenient distances along its course down to the sea, and thus supply the entire population. North of the mountain, from the source to the tunnel entrance, it was necessary to make a considerable *détour* to the east, in order to reach a point where the conduit could be run under the small stream, instead of over it, if security in war was to be attained for the water supply.

The French traveler, Guerin, about 1855, found a large reservoir beneath the floor of the chapel of St. John, and assuming this to be the original reservoir, opened the old conduit for some distance to the south. The chapel is built directly over the reservoir, which was constructed in the shape of a right-angled triangle, of which the hypothenuse was carved into an arc (Fig. 2). This side was cut out of the original rock and shows now the smoothed surface. The south side consists of a well-preserved wall (7·60 m. long), composed of squared blocks of limestone carefully fitted together without mortar, while the west wall (5·57 m. long) is made up in part of a late structure of bricks, behind which the ancient wall is concealed. To support the cover of the reservoir, fifteen pillars were constructed of large squared stones, in four rows parallel with the south wall. Each of these has a square base of about 0·75 m. long and 0·45 m. high, while the shafts consist mainly of three blocks of dissimilar hight, and 0·60 m. in length and breadth. The entire hight of the pillars must have been about 1·70 m. The covering was formed of stone cross-pieces laid from pillar to pillar and wall, over which flat slabs were closely fitted, so that the whole could probably be covered in out of sight. The ancient cover is still used as a part of the floor of the chapel, but a portion was destroyed in building the chapel, and has been reconstructed out of a miscellaneous lot of stones, many from the city itself. The floor of the reservoir was laid with limestone slabs.

On the north side, near the west corner, are two openings broken through the rock, through which the water streams into the reservoir. Just opposite, in the south wall, are two openings, an upper one through which the standing water flows off, and a lower one by which the reservoir can be drawn off, as was done for Fabricius in part, that he might make a more thorough examination. The outflow is now used by the inhabitants of the adjacent hamlet. The impression produced by the whole structure is that of the greatest solidity and the greatest antiquity.

*The conduit from the reservoir to the tunnel.*—About 10 meters south of the chapel, the conduit is now first met with. It is here a subterranean structure of sufficient hight and width for a man to walk in upright. On the floor of this conduit, lay the pipes in which the water flowed. It runs in a southerly direction on the edge of the ravine that lies to the west of it; and about 130 meters from the reservoir, it must have diverged somewhat to the east to pass under a small runlet, dry except after rain-falls, and then on nearly to the confluence of the two streams before mentioned. There it turns to the east up the right bank of the smaller stream for 320 m., and, at the distance of 556 m from the reservoir, bends to the south, passes under the stream, and thence southwesterly to the mouth of the tunnel, covering 853 m. in its entire circuit.

In this part of its course, the conduit is either tunneled through the rock where it was feasible, or cut through, and horizontal slabs of stone laid across from side to side as a cover; or, where the rock failed, the sides were constructed of polygonal blocks, with a similar covering. At distances varying from 22 to 80 meters, perpendicular shafts were made, either cut through the rock or built up with rectangular blocks. Twenty of these have been counted, and their number was increased by the abbot's workmen, to assist in removing the refuse in the trench. The depth of the ancient shafts varied, of course, according to the lay of the land. The last one, 60 m. from the entrance to the tunnel, was 13·80 m. deep, of oval form (1, 40 : 0, 90 m.), cut through the rock. The next one, 23 m. to the east, was 14·50 m. deep, and mostly built up. North of the creek, they were from 3 to 4 m. deep. They appear upon the map in black dots. The only place where an adit occurs is near the entrance to the tunnel, where the declivity is high and steep, and the trench lies 15 m. below the surface. The mouth of the adit is described as inaccessible, and hidden from sight by rocks. Fabricius conceives that Eupalinus kept to the ridge of the ravine, instead of cutting straight across to the point where he ran under the creek, in order to secure the easier disposal of the refuse down the declivity. Here becomes apparent the great deficiency in his report, the lack of levels, which he was unable to take.

Throughout the whole of this part of the aqueduct, great numbers of round clay pipes were found on the bottom of the trench. They were of two kinds, differing not in construction, but only in their length and in the quality of the clay. One of the larger ones is represented on the plate (Fig. 3), where its measurements will also be seen. They average about two feet in length (diameter 0·19 m.), with a shoulder at one end, which fitted into the end of the next one, and was fixed by a fine white cement. On the upper side of a number of those still well preserved, apparently in every other one in the original course, appears a round hole of 0·10–0·15 diameter, to give access to the inside of the pipe. The other kind of pipe is shorter (1½ feet), less numerous, and badly injured.

*The aqueduct through the mountain.*—It was this part of the course that excited the especial wonder of Herodotus, and of which he gave the description. Here we must distinguish, as he did, the tunnel proper, and the trench beneath, in which the pipes were laid. Fabricius was able to make his way some 500 m. into the tunnel from the south end; but on the north, at the distance of 106 m., his advance was stopped by huge stalactite pillars closing the passage. In general, the tunnel is hewn through the living limestone rock with hammer and pick, and where the walls are not covered with lime deposit, one can still see the marks of the single strokes. Except at the ends, the roof consists throughout of the original rock, maintaining the conformation of the strata, with a slope from west to east, as may be seen on the plan (Fig. 5), where one is supposed to be looking downstream from the north. In a few places only, has the roof given way and fallen in. As the roof is not always the same hight from the floor, so the side walls are not carefully smoothed and made vertical. All along in the walls, small niches were cut, about 0·10 m. deep, 0·15 high, and 0·20 long, in many of which terra-cotta lamps were found, as elsewhere in the tunnel. Numerous measurements in the southern half of the tunnel gave an average of 1·75 m. square, but 25 m. from the exit it was 2·15 high and 2·30 wide. The direction of the tunnel, with the exception of a few irregularities, is a straight line, 17 degrees west of north. Its entire length was made by Fabricius, measuring over the mountain with a protractor, 1000 m.

The construction was begun at both ends, and the two sections met 425 m. from the south end. At this point, the south section runs into the rock dead, and is there abandoned. South, 1·50 m., the west wall is broken through, nearly at a right angle, and the tunnel continued in a curve till it meets the northern section, as represented on the plate (Fig. 6). In other words, while the two sections were run quite accurately, each along its own line, the north end was begun a distance estimated by Fabricius as from 5 to 10 meters too far to the west. Not only was this error in the horizontal committed, but another in the perpendicular. The north section, just before it joins the other, is from 4 to 5 m. high, and the original floor, until it was cut down, must have been a meter higher than the roof of the south section (see Fig. 1). If this level was maintained from the outset, the north end should have been lowered 2·75 m. before starting, in order to meet the south section.

At each end of the tunnel, the rock did not offer sufficient firmness to sustain its own weight, and was consequently built up in polygonal walls of large blocks without mortar, and closed above by a sort of gable roof formed of blocks inclined against each other, as may be seen in the plate (Fig. 4). At the south end, are the remains of an ancient building closing in the entrance, in which were six steps, three of which are now *in situ*, mounting up to the tunnel proper. Here, for 12·70 m., the polygonal walls and gable roof form a passage 0·60 m. wide and 1·75 m. high, ending in a door whose threshold is still visible. This section is clearly contemporaneous with the tunnel itself. Next follows a distance of 14·50 m. cut through the rock, whose roof has at some time fallen in and is now supported by walls. Thence one passes for 2·60 m. between strong walls, 0·63 m. apart, covered partly by horizontal slabs. These walls are of later construction, as is another, 7·50 m. farther on, that fills up but half the passage (see Fig below No. 8). From this point, the tunnel advances through the live rock.

In the north section, the rock was more friable, and more of the passage had to be built up. The entrance now lies 8 m. below the surface of the slope, and there is no evidence, Fabricius maintains, to show that this was accessible or left open after the work was completed. The first 64 m. appear originally to have been found sufficiently stable, so that Eupalinus left this stretch without interior walls; but at some time in antiquity, a part of the roof seems to have given away; for at a distance of 14·50 m. from the entrance, the tunnel for 35 m. is built up with walls, apparently of Roman times, supporting a round, arched roof, and forming a passage about 0·60 m. by 1·78. Then succeed 14·70 m., where so much has caved in that one clambers over it with difficulty. Passing this, one reaches a point where the passage was built up by Eupalinus, and this construction continues as far as Fabricius was able to make his way, 106 m. from the entrance. The structure here is very similar to that in the south end, but somewhat more carefully done. The passage is built nearer the west wall than the east, and the blocks of the roof are slightly hollowed out so as to resemble somewhat a Gothic arch of considerable elegance.

Nine meters from the north end of the tunnel, the conduit from the reservoir approaches from the east, turns nearly at right angles, and assumes the direction of the tunnel itself, not under but along its eastern side, as will be seen on the plate (Fig. 8). Here, the bottom of the trench is 2·53 m. below the bottom of the tunnel, and where the turn is made, the conduit from the east, tunneled through the solid rock, has its roof 2 m. higher than that of the tunnel. Below the angle, the trench is tunneled in the rock likewise to the hight of 2 m., so that its roof is 0·50 m. lower than the floor of the tunnel. Its width is 0·60 m. Standing water prevented investigation farther south. However, in the place where the tunnel has caved in, a shaft connects the tunnel with the trench, which there, apparently, runs under the tunnel. Another similar shaft exists at the extreme point reached toward the south, but, like the tunnel there, it is filled with lime formation. Whether the trench was tunneled all this distance, or opened into the tunnel proper during its construction, and was afterward closed when the walls were built, Fabricius was unable to determine.

In the south section, however, the trench was for the most part open, and ran along the east wall, leaving a passage of more than a meter free on the west side of the tunnel. The perpendicular sides of the trench are far more carefully hewn and plumbed than those of the tunnel. About a meter apart, square sockets are cut on each side of the trench at the top, for the reception of cross-pieces to support a flooring, no doubt. At points 20 m. or more apart, a piece of the trench already dug was covered, at the hight of from 2 to 3 m. from the bottom, with flat stones, and upon these, as they proceeded, the refuse was built up quite to the floor of the tunnel, thus relieving greatly the labor of removal. On short stretches, too, the trench is actually tunneled through the rock.

Measurements of the trench taken along its course showed that it was gradually deepened from the north to the south end. At the junction of the two sections of the tunnel, its depth was 4·90 m.; 213 m. from th

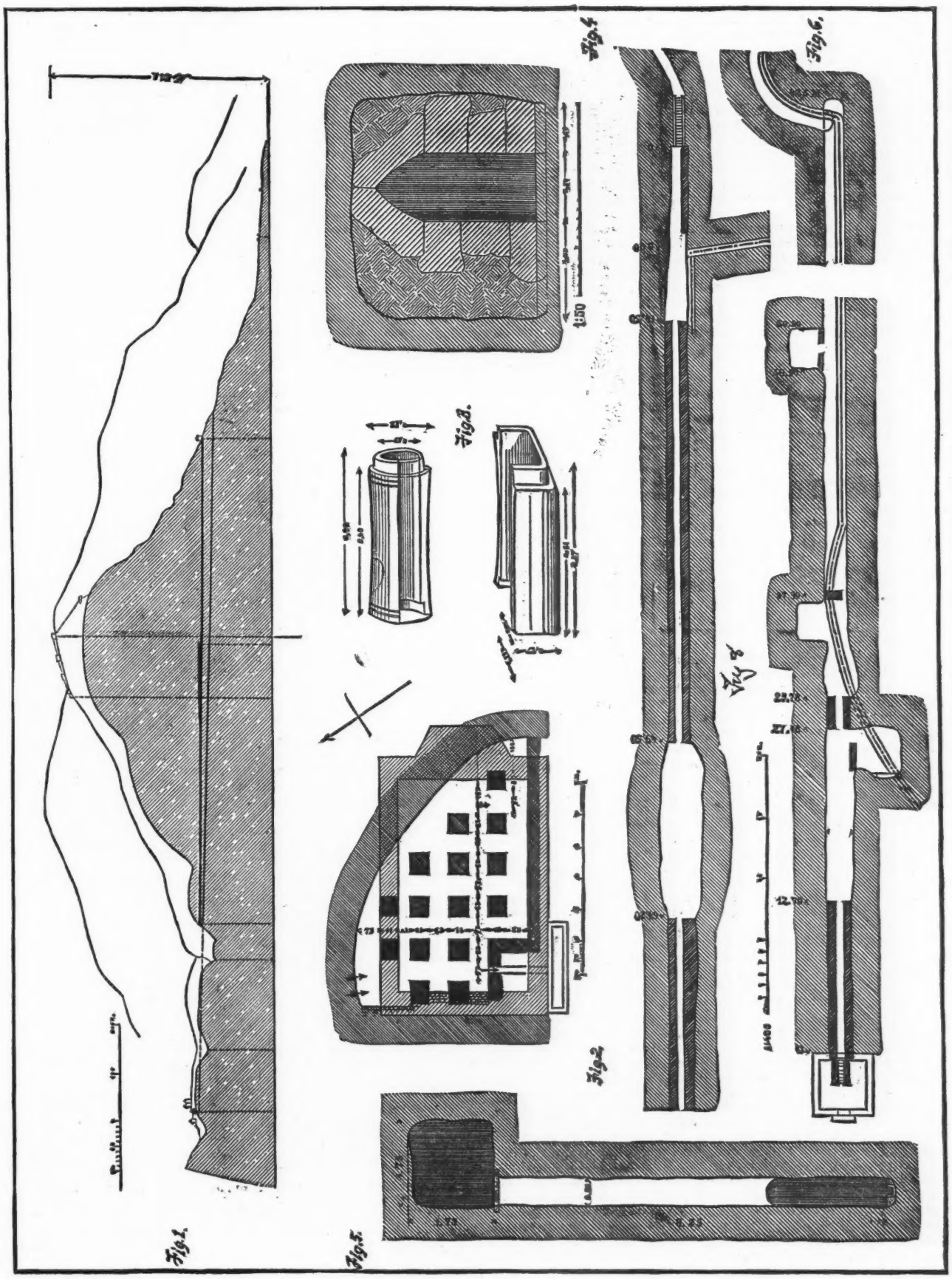


Fig. 1.
Fig. 2.
Fig. 3.
Fig. 4.
Fig. 5.
Fig. 6.

south end, it was 6 m.; where it leaves the tunnel for the city, 8·30 m. In the bottom of the trench, bedded in earth or clay, were laid the pipes, which were here not round, but square and open at the top, and fitted together with a shoulder like the others (see Fig. 3).

*The conduit in the city.*—Forty-five meters from the south end of the tunnel, the trench leaves the east wall, makes a *détour* to the west side, and after a space of 15 m., leaves the tunnel altogether and passes off to the east through the city. The construction here is very similar to that north of the mountain. At first, it is tunneled through the rock to the hight of more than 3 m., but of the usual width of 0·60 m. Farther on, it is covered with horizontal slabs, and where the rock did not supply walls, these were built up. The pipes are open as in the mountain. From time to time, smaller mains pass off to the south, to supply the inhabitants. Fifty meters from the tunnel, appears a perpendicular shaft communicating with the conduit, and thence for 332 m. twelve more are found, from 22 to 50 m. apart. Through these shafts, access could be had to the conduit at any time, as shown by the fact that several still have square stones covering their mouths, with circular holes through their centers, into which round covers fitted. In one case, a half of the round cover is still preserved, and, in another, three steps of an ancient stairway leading down from the south have been found in position.

The description of Herodotus is thus found to be verified in every particular except the exactness of some of the measurements. The size of the tunnel at the lower end, where he probably saw it, is the same, the depth of the trench there the same, though the width is a foot less. He made the length of the tunnel 1294 m., Fabricius 1000, while Dennis was told that it was 1270. Herodotus estimates the hight of the mountain at 274 m.; the English admiralty charts give it as 228.

It is to be regretted that the historian did not give us the reasons for the construction of the trench beneath in addition to the tunnel itself. It has been a standing puzzle to all commentators upon his history, and the solutions that have been offered are numerous. There are two that may be said now to stand the test of our more accurate knowledge of the structure. One is that of Curtius, who has given much time to investigating the Greek system of water conduits, and examined many on the spot. His opinion has been, that the tunnel was intended primarily as a substitute for the air-shafts, which it was impossible here to construct, but which are found so universally elsewhere. The most ancient tunnel of the kind known in Greece is assigned to the period of the so-called Cyclopean architecture, and must be contemporaneous with the bee-hive vaults of Orchomenus and Mycenæ, and the other gigantic structures whose remains still exist in the land. This tunnel was built to carry off the waters of Lake Copais in Bœotia, and is described by Forchhammer (*Hellenika*, p. 167 *seq.*) as running for four miles under-ground from the lake to the sea. Along its course, are about 20 vertical shafts, from 100 to 150 feet deep, and the tunnel is run under a valley where the surface could be reached most easily by the shafts. A shorter tunnel exists between Copais and the neighboring Lake Hylica. Here Forchhammer counted 8 shafts, and was assured by the natives that there were 15. In Attica, an ancient conduit conveyed water under-ground for a long distance, from the foot of Brilessus to Athens. North of the present Ampelokepos, 110 air-shafts have been counted, from 40 to 50 m. apart, sunk through the rock to the conduit, and covered with flat stones. Many are built up from the bottom and project some feet above the surface. Another conduit, running from Mount Parnes to the city, also had air-shafts, and they are seen in Italy in the *emissaria* of lakes Fucinus, Albano, etc. In the Roman aqueducts, they were constructed at regular intervals, either through the masonry at the top, or, if another channel passed over it, at the sides. Vitruvius lays down the rule that in a subterranean conduit they should be built every 120 feet. Of course, these would assist in the removal of the refuse while the construction was progressing; but this would not apply to the masonry of the aqueducts, and ventilation was the main object. Fabricius feels certain that the shafts in the Samian conduit, between the reservoir and the tunnel, were permanently closed, as well as the north end of the tunnel. But this may be doubted. It would be simple enough to cover them in out of sight for the time being, in case of a threatened invasion. The adit in the vicinity of the tunnel he acknowledges to have been kept open.

But granting that the tunnel may have been intended to supply the place of the wonted air-shafts, we are confronted by the fact that the trench beneath was sunk to a depth that is extraordinary upon any such hypothesis, and we may well ask why the tunnel would not have served its purpose in every way if the pipes had been laid along its floor. The fact is, that the tunnel seems to have been built first, and the level then found to be so high that the water would not run through it, and the trench was resorted to afterward as a stern necessity demanded by the law that water will not run up hill in open pipes. It has been seen that a mistake was made in the levels on the two sections of the tunnel itself, and the gradual lowering of the trench from the upper to the lower end, together with the hight of 3 m. toward the south end wherever the trench is tunneled through below, tends to prove that it was not till the water was actually brought down to the tunnel that they ascertained where it would run, and then they made an error toward the south and were compelled to dig deeper than they had calculated. The proper solution of this problem, however, as far as it can ever be determined, must wait until some competent engineer visits the island and makes an accurate determination of the various levels of the entire structure. As we have already said, this is the one desideratum in the accurate and painstaking account that Fabricius has given us. As it now appears, while striving to bring the exit to the tunnel as high as possible, that the whole town might be reached by the water, the constructor overshot the mark by 3 m. on the north and 8 on the south.

At Megara, the native place of the engineer Eupalinus, a long conduit bringing water from the mountains had been built, under the tyrant Theagenes, toward the close of the seventh century B.C., but we know nothing of its construction. The tunnel at Jerusalem, however, between the Virgin's Pool and Siloam, offers many suggestive points of comparison with that of Eupalinus. This has recently been very carefully examined by Lieutenant Conder in the interest of the Palestine Exploration Fund (see their reports for 1881–83), though it had been explored before by Warren, Robinson and others. Its course resembles an irregular S, so that it measures 520 m. by the channel, but the Pools are distant from each other in a straight line only 337 m. The width of two feet is pretty uniform throughout, but the hight varies greatly. In the first 360 feet from Siloam, the hight descends from 16 feet to 4 feet 4 inches; at 450 feet, it is 3 feet 9 inches; at 600, 2 feet 6 inches; at 850, 1·10; 900, 1·4. Here it suddenly rises to 4 feet 6 inches, and so continues for 150 feet, when it is again reduced to 2·6, and at 1100 feet, to 1·10. At 1450 feet, it runs on from 2 feet to 2·6, and at 1480 it rises into the open vault. The roof is flat, but the floor is hollowed out into a groove resembling an inverted sugar-loaf, in which the water ran and runs. The walls are mostly left rough, but occasionally a space is smoothed, and niches occur at intervals. Conder has shown that the work was begun at both ends, and the two sections, after wandering about considerably, and making many false heads, finally met, 944 feet from Siloam. This is proved by the fact that the false heads on each side of this point were worked in opposite directions. When the two parties had arrived within about 7 feet of each other, they were working nearly parallel, and it is to this that the inscription refers that was discovered on the east wall near the entrance from Siloam in 1880, and drew renewed attention to the tunnel. The inscription is thus translated:

"(Behold) the excavation. Now this is the history of the tunnel. While the workmen were still lifting up the ax, each toward his neighbor, and while three cubits still remained to (cut through), (each heard) the voice of the other who called to his neighbor, since there was an excess in the rock on the right hand and on (the left). And on the day of the excavation, the workmen struck, each to meet his neighbor, ax against ax, and there flowed the waters from the spring to the pool for 1200 cubits; and . . . of a cubit was the hight of the rock over the heads of the workmen."

The difference of hight of the two channels at this point of junction was just 13 inches, and Conder says, "The floor was probably cut down at both ends after completion to get the level, and if so, it was only accidental that the levels were so nearly at the same point of junction." The tunnel had two air-shafts, one 470 feet from Siloam, where the surface in a valley was only 14 feet above the tunnel floor; the second was about half-way between the first and the meeting-point of the two sections.

The date of this tunnel has been stoutly disputed. The inscription, from its epigraphic character, can not be later than 550 B.C., and most authorities refer it to the time of Hezekiah, 700 B.C. Sayce thinks it as early as the time of Solomon. It is evidently a poor affair in comparison with the work of Eupalinus, and while its levels proved better, it seems more good luck than calculation, and it is a wonder that the two sections ever met at all in their leisurely saunterings. No pipes were ever used in it, so far as appears, and it seems almost incredible that it should have been worked for a considerable distance with the hight only 16 inches and the width 24. If Eupalinus did make an egregious blunder in his levels, he produced a structure that was well worthy of the admiration of Herodotus and his countrymen.*

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**Land-Office Decision as to Surveyors-General.**—It has been decided that hereafter appointments for surveyors-general shall be limited to persons having a practical knowledge of surveying. Another rule adopted by the Interior Department is, that appointments as registers of land-offices, receivers of land-offices, and surveyors-general are not to be confined to residents of the territories in which the offices are located.

**New Orleans Exhibition.**—The World's Exhibition will be closed on May 31st. It is said that the friends of the Exhibition have raised $95,000 by subscription to meet the expense of carrying it over until next November, when it will be reopened. Superintendent Jeffery, of the Illinois Central Railroad, has telegraphed that the railroads and car companies reaching New Orleans will subscribe $100,000 toward the expense of reopening next winter. The Board of Management has paid off 50 per cent of its indebtedness, and believes that the Exhibition can be reopened next winter free of debt.

**New York and Brooklyn Bridge.**—W. A. Roebling, chief-engineer of the bridge when it was building, has written a letter in response to inquiries sent to him by President Stranahan, of the Bridge Trustees, stating that the bridge could be used without detriment by Pullman cars and loaded freight-cars, the weight of which does not exceed thirty tons; but that locomotives of that weight, by reason of their shortness and the concentrated weight, would strain certain parts of the bridge beyond safe limits. Locomotives on the bridge should, he says, be limited to about eighteen tons' weight, which would strain the bridge in minor parts about the same as Pullman cars weighing thirty-two tons. Such a locomotive could draw two Pullman cars or two freight-cars up the grade of the structure. Mr. Roebling adds that he is convinced from the experience of the past year and a half that, as soon as increased switching facilities are provided in New York, so that three or more cars can be run in a train, the rope traction system on the bridge can not be excelled by any other in respect to regularity, economy, average speed, and number of passengers transported.

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* The discoveries described above, furnishing details unknown before of the Tunnel of Polycrates, give a new historical interest to the description of Herodotus, in many points of view.

It is only within a few years that a tunnel of this magnitude and extent would not have been considered an engineering work of more than ordinary magnitude, not only in its engineering aspects, but as a financial enterprise. Connected with a modern project for the supply of water to a city, it would even now excite unusual attention. The methods of excavation in rock must have been slow and tedious when this tunnel was made, compared with the rapid work of gunpowder and dynamite at the present day, and it would be especially interesting to know all the tunneling processes employed by the ancients. Among these, not the least in interest would be the ventilation of the tunnel during the progress of the work without ventilating shafts.

The facts brought out that in this and in other ancient tunnels, the line of the tunnel was laid out and prosecuted from both ends toward the middle point, the *termini* not being intensible, would show some knowledge of surveying and leveling, even though the methods might have been rough and the instruments of the rudest sort. While the fact that the two lines from the ends did not coincide at the point of meeting, and the grade from one end to the other was not established with accuracy would show that the requisite knowledge to bring about these results did not then exist, or at least was not applied.

There seems to be no doubt, as stated by Professor Merriam, that the trench in the flow of the tunnel was the real conduit made necessary, perhaps, by the incorrectness of the grade of the main tunnel. The grade of the trench was probably obtained by allowing the water to "follow the workmen," a common practice in excavating ditches at the present day.

## FURNACE, MILL, AND FACTORY.

The rolling-mill of the Potts Brothers Iron Company, Limited, of Pottstown, Pa., which has been lying idle since last fall, started up on single turn in all its departments May 18th. The firm has received orders to keep it going for some time.

Work was begun May 18th at relining stack No. 5 of the Allentown Iron Company, at Allentown, Pa., preparatory to blowing in the furnace. It has been idle since 1880.

The rolling-mills of the North Chicago Mill Company, situated at South Chicago, resumed operations May 18th. The mills shut down April 1st, owing to a general strike of the workmen.

Owing to the confused state of the affairs of the company that some time ago absorbed the Vulcan Iron-Works of St. Louis, Mo., the Grand Tower Company of Illinois, and the Pilot Knob Company of Southeast Missouri, a plan is on foot to call in all the outstanding bonds of these three concerns, which amount to $2,600,000, and to issue in their stead $2,000,000 of new bonds, covering the combined assets of the company. John W. Noble, C. C. Moffett, and Pierre Chouteau have been appointed by the Vulcan bondholders to go to New York to endeavor to effect an arrangement with the bondholders in the other companies for carrying this plan into effect.

A new iron foundry plant has just been completed, at a cost of $10,000, by George F. Payne & Co., builders, for William H. March, at Philadelphia, Pa. The building is fitted with all the latest improved appliances, with a capacity melting twenty tons of iron a day.

The Bellaire (Ohio) nail-works have shut down in all departments except the furnace, which will be continued for several weeks. The steel-works and nail factory will remain idle until the workmen accept the terms of the managers.

The large iron-works of the Viaduct Iron Company at Coatesville, Pa., will soon put their entire works on double run.

The Commissioner of Patents has denied a motion for a rehearing in the patent interference proceedings of Siemens against Edison against Fields. The matter at issue was a patent for the application of electricity as a motive power to railroad cars by means of the rails, and the decision of the commissioner sustains the findings of the examiners in awarding priority of invention to S. D. Fields, of New York.

Riter & Conley have been awarded the contract for the building for the Bessemer plant at Shoenberger & Co.'s works, at Pittsburg, Pa.

The Alikanna Iron-Works, near Steubenville, Ohio, are rapidly getting into shape to be started up.

Manager George Moore, of A. & D. H. Chambers's window glass factory, has applied for a patent on a gas melting-furnace of his own invention. The furnace will be conical in shape, and so constructed that, in the event of a sudden cessation of the supply of gas, slack can be burned without any difficulty. No artificial blast will be required. It is probable that a furnace of the kind may be built at Chambers & Co.'s factory.

The puddling department of the rolling-mill at Cumberland, Md., started up on single turn May 18th. Work in the plate mill will also be resumed and the 8 and 12-inch bar-mills will run this week.

Proposals will be received by the superintendent of the United States Mint at Philadelphia until June 17th for furnishing supplies, such as acids and other chemicals, metals, coal, lard oils, salt, borax, crucibles, covers, stirrers, and other necessary supplies. Proposals will be considered separately.

The Western Nail Association will meet at Cincinnati, Ohio, May 27th.

The Allentown Iron Company will soon make application for a charter. The works will be for the manufacture of iron, and will be located in the city of Allentown, Pa. The principal office will be in Philadelphia.

A mill for the manufacture of all kinds of pipe is to be built at Scottdale, Pa.

Judge J. P. Bradbury, assignee of the Crescent Iron-Works, Pomeroy, Ohio, offers the plant at private sale.

It is stated that the Meier furnaces, near East Carondelet, Ill., owned by the Meier Iron Company, of St. Louis, will soon begin to manufacture Bessemer.

The extensive works of the Franklin Iron Company, at Franklin Furnace, New Jersey, have been closed. The blast at the furnace has not been out before in many years. Operations in the seven iron mines have also been suspended. The cause of the suspension is undoubtedly the disagreement between the workmen of the Scranton Steel-Works and Colonel Scranton, the owner of the works, as the Franklin Iron Company furnishes those works with Bessemer pig from which the steel rails are made.

The nail department of Brown, Bonnell & Co., at Youngstown, Ohio, started full blast May 18th, and is run day and night to fill unexpected orders.

## LABOR AND WAGES.

The workmen of the North Chicago Rolling-Mill, at South Chicago, Ill., resumed work May 18th, at the old price, from $1.25 to $1.50 a day.

It is the desire of the Commissioner of Labor to make a report at the next session of Congress, showing some progress toward the objects sought to be attained by the establishment of the bureau. The seventeen special agents just appointed will be dispatched as soon as practicable to the places where they are to conduct their inquiries. Four of them will be sent to Europe, and the remainder will pursue their investigations in this country.

Forty men began mining at Straitsville, Ohio, May 18th, at the reduced rate of 40 cents a ton. This is the first mine to start at Straitsville since the long strike.

The coal miners' strike at Belleville, Ill., ended May 18th.

## TRANSPORTATION NOTES.

The twenty-fifth report of the master relating to the ninth audit of the accounts of the receivers in the Philadelphia & Reading Railroad litigation has just been filed in the United States Circuit Court office at Philadelphia. It showed the receipts of the railroad company for the month of March, including a balance of $76,343.42 from February, to be $2,407,942.03. The balance on April 1st was $297,677.21. In the account of the Coal and Iron Company for the same month, including a balance of $7535.34 from February, the receipts appeared to be $1,160,306.31 and the balance April 1st, $10,599.47.

The insolvent Union Canal Company was sold out under foreclosure by the bondholders at Philadelphia, April 19th, and was bought for $6000 by the Philadelphia & Reading Railroad, which holds about two thirds of the bonded debt. The Union Canal has been controlled and operated by the Reading for years. It connects the Schuylkill and Susquehanna rivers.

The announcement has been made that the last gap in the Canadian Pacific Rail road has been closed, and that the line is now continuous to the Columbia River.

The injunction proceedings have been dissolved in the case of the Philadelphia & Reading Railroad Company against the Pennsylvania Schuylkill Valley Company, involving the right of the latter to cross at grade the Reading Company's sidings.

The earnings of the Marquette, Houghton & Ontonagon Railroad for the first week of May were $4885, and for the corresponding week last year, $14,787. The explanation of the large decrease is, that last year $9500 were received for transportation of ore. Nothing has been done in ore-shipment this year, as navigation has not yet opened.

## COAL TRADE NOTES.

In accordance with the act of Congress regulating gas-works, the Secretary of the Washington Gas-Light Company has sent to the Secretary of the Interior a list of the contract prices to be paid by the company for coal for the ensuing year: Youghiogheny, Pa., 2500 tons, $3.95; 10,000 tons, $3.95; Fairmont, West Va., 1500 tons, $3.90; Despard, West Va., 1500 tons, $3.80; Kanawha, West Va., 3000 tons, $3.95—an average of $3.93¾ a ton.

### COLORADO.

The Colorado Fuel Company intends to erect and operate a coal elevator at Denver, to be used in handling and storing anthracite coal. The company leased the anthracite coal mines at Crested Buttes last August. The storing capacity not being great enough to admit of working the mine to its full capacity all the time, has made it necessary to provide additional storage room.

### ILLINOIS.

The Fairbury Coal Company, of Fairbury, has been incorporated to mine and sell coal; capital stock, $20,000; incorporators, Henry E. Hamilton, John W. Walton, and Isaac Walton.

### OHIO.

Mr. Walters, the superintendent of the Pittsburg & Wheeling Coal Company, devised the arrangements and managed the work at the mines, mentioned in our last number on page 343.

### PENNSYLVANIA.

The bill for a commission to investigate coal waste was defeated in the Senate May 19th.

#### ANTHRACITE.

The Philadelphia & Reading Railroad Company, lessee of the East Mahanoy Railroad Company, has filed a bill in equity, stating that the Buck Mountain Coal Company is driving a water-course gangway eastwardly toward the East Mahanoy tunnel, and proposes to drain its colliery into the railroad tunnel, and that this would do a great deal of damage. A rule was asked for and granted to show cause why an injunction should not be issued to restrain the coal company. It was made returnable on the first of June.

#### BITUMINOUS.

The examination of applicants for mine inspectors in the bituminous region took place at Pittsburg May 19th.

The bituminous coal mine bill before the Senate has been postponed for the present.

#### COKE.

The Atlas Coke Company has been incorporated, with a capital stock of $40,000. The company's office will be in Pittsburg. W. A. Shaw, of Sharpsburg; Frederick Gwinner, Jr., of Alleghany; Robert Montgomery, of Pittsburg; James Henderson, of Dunbar, Fayette County; and W. A. Blythe are stockholders.

H. C. Frick filed a bill in equity at Pittsburg, May 14th, against A. A. Hutchinson, Peter Rumbaugh, and others, to compel the conveyance to him of 85 acres of coal land, which is a part of the tract connected with the Standard coke-works in Westmoreland County. Frick bought the works, 573 ovens, and 185 acres of coal land from Hutchinson for $700,000, but alleges that Hutchinson failed to convey the tract described, which he had contracted to purchase from the other defendants.

## GAS AND PETROLEUM NOTES.

Exports of refined, crude, and naphtha, from the following ports from January 1st to May 16th:

| | 1885. Gallons. | 1884. Gallons. |
|---|---|---|
| From Boston | 2,354,169 | 2,143,626 |
| Philadelphia | 41,114,371 | 20,821,988 |
| Baltimore | 3,129,828 | 2,150,891 |
| New York | 125,261,963 | 125,262,051 |
| Total exports | 171,860,331 | 150,378,556 |

### PENNSYLVANIA.

Graff, Bennett & Co., of Pittsburg, have introduced natural gas into their Thirty-second street rolling-mill.

## GENERAL MINING NEWS.

### ARIZONA.

#### COCHISE COUNTY—TOMBSTONE DISTRICT.

CONTENTION HILL.—This company, at Tombstone, has been incorporated. The directors are Rudolph Cohen, William Cunningham, Joseph Naphatly, William C. Chapman, and Alexander L. Bodt. Capital stock, $10,000,000.

#### PIMA COUNTY—QUIJOTOA DISTRICT.

Denver capitalists have visited Nogales with the view of erecting a thirty-ton smelter. Sampling-works are in the course of erection.

Work at the different mines continues as usual. The water-pipe is laying, and the necessary operations for the erection of the pumping machinery and the mill are progressing satisfactorily.

#### YAVAPAI COUNTY.

An occasional correspondent has sent us the following from Prescott: There is nothing here to elevate the spirit of man, but every thing to depress it. It is hard to write under discouragement, but easy enough when all goes well. I did not send a record for the past year because every thing seemed a failure. First came the downfall of the Howell Smelting Company, when it had promised so much. Howell blames the company for forcing him to build a smelter first when he should have put up a concentration mill. No doubt had that been done, the whole affair would have been a complete success, and it would have been of vast benefit to the district, as there is an abundance of concentrating

ores near at hand. The plant was purchased at sheriff's sale in February last, and things were going to start right away in high feather; but the whole affair ended in wind. Nothing was done, and now the mill is dismantled. Why? Nobody knows. The Peck subsided, I suppose, because they did not immediately run into another body of high-grade ore. The sundry Turkey Creek concerns have been getting ready, but I do not think they ever will be ready to show much coin. The Senator mill was moved to the Kimball mine, and that proved a fizzle.

The United Verde has been conquered by the low price of copper and costly transportation on a heavy mountain road. The one fine and noteworthy exception to this record of disaster is the Dosoris Company. It has pursued a steady, conservative, and successful course. It has worked the mine for all it was worth. The vein was small and the rock hard, and it is now worked mostly by tributers. In the mean time, the company has secured the old Sterling mine in the Hassayampa District, and is preparing to erect a concentrating mill upon it, and has every prospect of success.

A concentrating mill is erecting in the Big Bug District under the direction of John A. Church, M.E., to work an extension of the Belle mine.

All the talk now is of a railroad north and south, and I have no doubt it will soon be commenced. This will bring new blood into the country and be of great benefit. At the old Atzlan mill-site, a temporary mill is erecting over the old tailing-pits, in which it is estimated there are $20,000 on $25,000 of the precious metals. Mr. John Blandy, a well-known mining engineer, is, it is stated, in charge.

## CALIFORNIA.

### INYO COUNTY.

MODOCK CONSOLIDATED.—The furnace was to start on the 10th inst. The mine is said to be looking well.

### PLUMAS COUNTY.

FOREST KING.—The hauling of ore from tunnel No. 2 has begun, and crushing at the Arcadia mill will soon begin.

INDIAN VALLEY.—A tunnel is running to tap the Indian Valley shaft. At the junction of the shaft and the tunnel, hoisting machinery will be placed to be run by water-power.

### VENTURA COUNTY.

The antimony mines, situated about sixty miles from Ventura, are, it is said, worked at the present time with considerable success. They are on the north slope of the San Emidio Mountain, five miles from the summit. A mill is in the course of construction and will soon be in working order.

## COLORADO.

### BOULDER COUNTY.

GERMANIA.—H. E. Dickhart has gone East in the interest of the Gray Eagle and Morning Star lodes. These veins are cut at a depth of 125 feet, through the Independent tunnel, and are all owned by the Germania Company, of Cincinnati.

### CLEAR CREEK COUNTY.

The consolidation of the several properties owned by Colonel Osbiston and his associates, comprising several large paying mines, together with a stamp and buddle mill and smelter, is reported.

CHAMPION-DONALDSON.—The mill is running night and day on the free gold ores of these mines. The returns are satisfactory, and are gaining steadily. A strike of excellent ore has been made in the bottom of the Champion mine, on Bellevue Mountain.

GOLDEN LEAF.—The mine and mill on Soda Creek has been leased to Hellman & Anderson, who are running the mill and working the mine with every prospect of success.

IDAHO SPRINGS SAMPLING-WORKS.—Messrs. Gillem, Michel & Sackett have leased these works, lately vacated by Mr. Benjamin D. Allen. The company is making a few necessary repairs, purchasing ores, and sampling.

### CUSTER COUNTY.

BASSICK.—Work progresses satisfactorily in sinking the new shaft.

BULL.—Steam-drills and an air-compressor have been purchased by the new management.

KEYSTONE.—A bond has been executed on this mine and work begun.

TERRIBLE.—At the mine and mill, a liberal amount of ore is concentrated and the work is constant, with a transfer of over 100 tons daily from the mine into about one car-load of concentrates. This is the lowest grade ore worked in this county.

### DOLORES COUNTY.

DOLORES VALLEY.—The properties of this company are again to be worked. For more than a year, the mines have been idle, but recent successes in smelting the ores of this district have prompted a resumption of operations. The company has, it is said, good financial backing. A large amount of money had been expended previously in the purchase and development of claims at Rico. The company owns very nearly one hundred claims in this district, and a large number of these are held under patents from the government. The following officers were elected at the annual meeting held in New York City some time ago: President, Rush C. Hawkins; Vice-President, Jordan L. Mott; Secretary, F. H. Lawrence; Treasurer, Edward L. Oppenheim; General Manager, C. O. French. At Rico, the affairs of the company will be looked after by Mr. French and the resident superintendent, William Davidson.

### GILPIN COUNTY.

CENTRAL UNION.—In the west end of the main shaft, the junction of the Bugher and Galena veins has been struck. The width of the crevice has not been determined, the foot-wall of the Bugher having not been reached. Sinking will be continued to 560 feet, when levels will be extended east and west 550 feet to the boundary lines of the property.

NEWFOUNDLAND.—The company is hoisting the water and *débris* from the main shaft, and timbering it up where necessary. As soon as this is completed, sinking will begin and drifts will be driven.

### LAKE COUNTY.

We condense the following from the Leadville *Herald:*

ADAMS.—A new shaft is to be sunk on one of the company's properties that promises to be another productive mine.

ANTIOCH.—This mine, on Breece Hill, will soon begin producing gold ore in considerable quantity.

CHRYSOLITE.—It is stated that several important discoveries have recently been made by Mr. R. N. Clarke, the manager, which will enable him to operate the company's mill to much better advantage than heretofore.

DENVER CITY.—The extraction of iron and small quantities of first-class ore continues. Considerable well-directed exploration-work is also carried on.

DUNKIN.—The north shaft is to be sunk to greater depth.

EVENING STAR.—The product for April amounted to 1145 tons of iron ore. Of this amount, the company mined 782 tons, while 363 tons were extracted by the leaser. No lead ore was produced during the month. The iron stope in the vicinity of the No. 2 winze of the Evening Star is assuming large dimensions, having opened into an immense body. The ore carries 45 per cent excess of iron over silica, and nets about seven dollars a ton. Some special lots have returned much higher figures.

IRON SILVER.—The case of the Iron Silver Mining Company, owning the Moyer placer, *vs.* the Sierra Nevada, has just been tried in Denver. No decision had been rendered up to May 15th.

LEE BASIN.—The work of repairing and rebuilding the plant is rapidly drawing to completion.

MAY QUEEN.—The force has been reduced. The output of the entire property has been light for some time past, owing to a decline in the value of the ore, and the temporary high charges made for smelting dry silver ore. The lessees are actively exploring the territory for new ore-bodies.

MIKE & STAR.—There is a probability that work will be resumed on the company's properties on Breece Hill.

MORNING STAR.—At the upper Waterloo shaft, some good ore is taken out by leasers. Considerable low-grade ore is also extracted and worked in the concentrating mill, situated on the premises. The product for April amounted to 1243 tons of ore, excluding the yield of lease workers.

ROBERT E. LEE.—A body of lead ore has been disclosed above the old slopes.

SILVER CORD.—The company is said to be in pretty good condition financially, and it is possible that a dividend will soon be declared.

WOLFE TONE.—The erection of the building for the concentrating mill is advancing rapidly,

### LA PLATA COUNTY.

At the smelter at Animas City, which was not completed until late last fall, several changes have been made. Recently, a trial run of the Duryea process was made with success. The ores that are treated are principally from the Hoff mine, at Silverton, which has a very large body of low-grade refractory ore that is too poor to stand transportation and treatment at any of the ordinary furnaces. It only runs from 12 to 18 ounces in silver, and from 20 to 35 per cent of copper. This furnace is running through about thirty-five tons a day, making a matte that runs from 90 to 100 ounces of silver and about 60 per cent of copper. This matte is to be shipped East for treatment, where the copper will be made to more than pay for the whole treatment.

### MONTROSE COUNTY.

LONE TREE.—The company owns and proposes to operate five placer mining claims situated in the Vixen Mining District. It is incorporated under the laws of Utah with a capital of $1,000,000.

### PARK COUNTY.

DANSER.—An amalgamating mill will be built at this mine as soon as the season is far enough advanced to permit the prosecution of work. The engine for the mill has already been purchased of the Woodbury Machine Company, of Rochester, New York, and will be shipped at once.

EXCELSIOR.—A mill is to be erected at the mine for treating ore by the Meach process. The project is strictly a private enterprise. The entire plant of machinery is on the way, one car-load having already arrived.

GREAT WEST.—A contract has been let for the sinking of a new shaft, and the work will be prosecuted as speedily as possible.

SOVEREIGN.—Mr. D. H. Jackson, the superintendent, is permanently located at the mines, where he can oversee the extensive mill plans of the company.

### PITKIN COUNTY.

BEST FRIEND.—The mine is idle, awaiting the arrival of hoisting machinery, which is to be put in as soon as it can be got.

GRAND OPENING.—A small quantity of ore is produced, running from 100 to 300 ounces in silver to the ton. The men are sinking on a three-foot body of low-grade ore, and are down about ninety feet.

### SAN JUAN COUNTY.

CARIBOU.—Mr. W. H. Thomas has secured a four years' lease on the Caribou mine in the Ophir District. Hitherto, all ore has been hoisted from 100 to 300 feet through the shaft. Work will begin at once on a cross-cut tunnel designed to give the workings an increased depth of 200 feet.

LONDON & SILVERTON.—Mr. W. Thomas, the manager, is expected at the mines soon, when operations will begin.

## DAKOTA.

FATHER DE SMET.—The superintendent has made the following official report: The clean-up of the mill for the final run in April gave 1135·30 ounces gold, making a total of 1910·85 ounces for the month's yield. The general outlook at the mine is beginning to be more favorable. The extensive ore-bodies in the Golden Gate and Eureka open cuts show some improvement in the quality of ore. As yet, the general average of the ore throughout the mine is rather low, but with the present favorable indications, the chances of soon getting into a higher grade seem very bright. There is no change yet to report with the east cross-cut, fourth level. The face is out about 90 feet.

HARNEY PEAK TIN MINING COMPANY.—This company, of which Mr. E. N. Riotte, mining engineer, of New York, is the consulting engineer, is preparing to erect a 200-ton concentrating-mill to which will be added smelting-works for the reduction of the black tin. The plans are now finishing by Mr. Riotte. The mill will consist of crusher-rolls, screens, and concentrators—probably the Golden Gate. It is expected to have the works running by the 1st of August. The company owns a number of mines, among them the famous Etta mine, a description of which was given in the ENGINEERING AND MINING JOURNAL of September 8th and 15th, 1883, August 2d, October 25th, and November 29th, 1884, etc.

SITTING BULL VS. RICHMOND.—The case in which the Sitting Bull Mining Company is the appellant and the Richmond Mining Company is the respondent, is now before the Supreme Court. The case involves valuable mineral lands in the Black Hills worth probably $2,000,000, and is most ably represented on both sides. In 1877, the corporation known as the Sitting Bull Mining Company discovered a vein of rich ore,

located a claim, and followed the find. The Richmond Company struck the lead, and likewise followed the vein. After tunneling 640 feet, the Sitting Bull Company intersected the Richmond tunnel. The Richmond Company procured a temporary injunction restraining the Sitting Bull from proceeding further. The case was tried before Judge Church, and decided in favor of Richmond. Fifty-six days were consumed in the trial, and the defendants in action expended thousands of dollars in procuring maps, cuts, and casts of the two tunnels and adjacent claims. The law of the apex was the principal point involved. The Sitting Bull Company appealed from the decision. It is said that under Judge Church's opinion claims are not secured by a United States patent. The decision of the Supreme Bench is awaited with much anxiety by the mining interests of the territory.

## IDAHO.

CYCLOPS.—The openings show from 4 to 15 inches of solid high-grade galena ore. The length of the chimney on the tunnel level is over 75 feet. There are about 15 tons of ore on the dump, and stoping is to begin. A contract has been made for hauling the ore to Hailey for $5 a ton.

## MICHIGAN.

### COPPER MINES.

ESSEX COPPER COMPANY.—This company has been organized with a capital stock of $500,000, paid in $2000, and $1700 real estate, etc.; M. Richardson, Henry Van Schaick, I. C. Tawger, John C. Eastmond, all of New York City, and Alfred Meade, of Ontonagon, directors.

### GOLD AND SILVER MINES.

FRONT RIVER.—This company has been incorporated with a capital stock of $500,000, paid in real estate of value of $10,000; Joseph A. Ames, John W. Rice, Caspar Smith, all of Houghton, directors. Mine located in Marquette County.

### IRON MINES.

MINESOTA.—The expiration of original thirty-year charter and articles of renewal have been filed; capital stock, $1,000,000; paid in, $456,000.

## MONTANA.

### LEWIS & CLARKE COUNTY.

BOSTON & MONTANA.—Official advices show that the product for April was $37,920.56. The mill was closed from April 28th to May 2d, in order to put in the Boss continuous process and to make other necessary repairs.

MONTANA COMPANY, LIMITED.—R. M. Brereton, the newly appointed general manager, has arrived at Marysville.

### MEAGHER COUNTY.

COLLAR.—It is reported that this company's mill and mine at Maiden have been sold at sheriff's sale. The outfit was purchased by Eugene Smith, agent for the company, for $7500. The difficulties in the way of resuming operations are, it is said, removed by this sale, and a force of miners will be put to work soon.

GOLD BLUFF MINING AND MANUFACTURING COMPANY.—This company has been organized for the purpose of purchasing and dealing in ore and other articles, and to appropriate, purchase, and sell water rights and privileges. The capital stock is $30,000. fully paid up. The stock is not assessable. The officers are: John S. Tooker, President; J. B. Clayberg, Secretary and Treasurer; and Thomas G. Merrill, General Manager. Trustees: August M. Spratt and George L. Maltz, of Michigan; John S. Tooker, T. G. Merrill, and J. B. Clayberg, of Montana. The place of operation is Trout Creek, Meagher County, and the principal place of business is at Helena.

MAGINNIS.—A six-foot body of ore has been struck in the new tunnel in the Oro Cache mine, owned by this company.

## NEVADA.

### EUREKA COUNTY.

An abstract statement from the quarterly assessment-roll of the mines of Eureka County for the quarter ended March 31st, 1885, shows that the small mines produced and worked over 11,000 tons of ore, the gross yield or value of which was about $210,000. Most of these mines are worked on a very limited scale by leasers and tributers, and but few of them are worked below a depth of 150 feet.

EUREKA CONSOLIDATED.—Official advices from the superintendent say that they did not hoist any ore during the week ended May 9th, but that there were about 400 tons extracted and in the mine ready to hoist as soon as they can make dump room. Bennett's pitch does not look as well as it did; but it may change for the better at any time. Stevens's pitch on the second K. K., and Heelman's on the eighth level, show some improvement. Every thing in and around the mine is in good condition, and waiting the completion of the furnace to see what can be done with the accumulated ore and new discoveries. A telegram dated May 19th said that the furnace would start that evening. Williams's pitch is in ore 75 feet, and ore is going up and down. Bennett's main vein is petering out, but prospecting goes on.

### HUMBOLDT COUNTY.

PARADISE VALLEY.—The difficulties in regard to the wages question have been amicably adjusted, and work resumed.

### STOREY COUNTY—COMSTOCK LODE.

ALTA.—A little ore is taking out from a point about 70 feet above the 950 or 20 feet above the 900 level, and the stringers in the vein are followed in the hope of finding a large body of ore, with a fair prospect of succeeding, as these stringers are gradually widening in the direction of the 800 level.

BALTIMORE CONSOLIDATED.—The tributers are still taking out ore on the 200 and 400 levels. They have not begun building a roasting-furnace, as the materia] is not on the ground.

CONSOLIDATED CALIFORNIA & VIRGINIA.—The report for the week ended May 9th shows that there were hoisted 413 tons of waste and extracted 712 tons of ore. Shipped to the Morgan mill 417 tons of ore. The assay value of the ore milled during the week, as per battery samples, is $11.67 a ton. Ore extracted under the Jones contract, 676 tons. Shipped to the Eureka mill under this contract, 809 tons. The assay value of the ore milled during the week, as by battery samples, is $14.76 a ton. The drift running southwest into the Consolidated California & Virginia mine from the south line of the Ophir ground on the 1500 level has been connected with the old north drift on the same level.

HALE & NORCROSS.—The series of accidents that happened to the hydraulic pumping machinery at the Combination shaft has retarded operations at the mine somewhat. No important developments have been made since the last report.

KEYES.—Preparations are making for the resumption of work.

OPHIR.—As soon as the water has been drained from the 500-foot level, the work of clearing out the shaft will begin, and the extraction of ore from the old fillings on the 250 level, which was abandoned at the time of the fire in the old Central tunnel, will be resumed.

OVERMAN.—The extraction of ore from the 226-foot level has begun. The average daily yield is between 50 and 60 tons, which is shipped to the Vivian mill for crushing.

## NEW JERSEY.

### MORRIS COUNTY.

CHESTER HIGHLAND.—The Hydro-Carbon Ore-Roasting Company is constructing a desulphurizing kiln for this company between the two shafts of its mine on the north side of Main street, Chester.

## NEW MEXICO.

### GRANT COUNTY.

The different camps are working along steadily. Gold Hill, Gold Gulch, Bullard's Peak, Fleming, Alma, Piños Altos, Georgetown, and all the surrounding country are steadily producing. As soon as the works at Silver City for treating ore are in running order, and are ready to begin buying, ore will flow in in steady streams.

GOLDEN RULE.—Negotiations are pending for the purchase of this mine.

PINOS ALTOS.—The mill is running on full-time with a steady supply of ore from its own mines.

ST. LOUIS.—This copper mine, situated in the Burro Mountains, is soon to be opened up again. A contract is to be let for running a drift 500 feet from the bottom of the main shaft, which is now 600 feet deep. At present, the three lower levels are filled with water.

## PENNSYLVANIA.

### CHESTER COUNTY.

A discovery is reported from the northwestern portion of this county. At the Falls of French Creek, the immense rocks for which the rather wild and romantic spot is famous, are gneiss or granite of the best quality, and workmen are busily engaged in splitting them into curbstones ten, twelve, and fifteen feet in length. A company for working the stones is forming.

### NORTHAMPTON COUNTY.

The National Slate Exchange at Easton held its first regular call sale May 20th, and disposed of $20,000 worth of roofing and school slate. The price for roofing slate ranged from $4 to $3.75 a square, according to sizes.

## UTAH.

### BEAVER COUNTY.

The new concentrating-works erecting by A. G. Campbell at Milford, for the treatment of the ores of several of his mines and also for custom ores in case the supply runs short, in the Star district, will be finished and in operation in about a month. The concentrator will be capable of treating 100 tons of ore per day.

### JUAB COUNTY.

MAMMOTH.—The long-standing case of Elias Morris *vs.* the Mammoth Mining Company, or in reality Elias Morris *vs.* A. Cunningham, William and Samuel McIntyre, came up in Salt Lake City May 15th.

### SUMMIT COUNTY.

CRESCENT.—The tramway is running in good style, and the concentrator is worked to its full capacity. The stock is held at $1.25.

### WASHINGTON COUNTY—SILVER REEF.

The Stormy King and other north-end properties are looking as well as at any previous time.

CHRISTY.—The six-foot vein in the California 300 level north is stoping moderately, as there is no immediate demand requiring it to be drawn upon.

STORMONT.—In the Savage mine, the 500 level south has been pushed rapidly forward, and has encountered the ore-body that has been so productive in the levels above. A connecting winze shows at that point 200 feet of high-grade ore, and is undoubtedly the same ledge now worked in the Maggie, adjoining on the south. The entire south workings are yielding abundant good grade milling ore.

## WISCONSIN.

NORRIE.—The mine is to be worked this season, and active steps are taking for the erection of the necessary machinery.

NORTHERN BELLE.—A mill is to be erected. At the mine, the work has progressed until the vein has been developed for a distance of 1000 feet in length, a shaft sunk 120 feet in depth, and the vein cut an average width of 28 feet. The tunnel has cut the main lode at a depth of 240 feet from the surface, and the vein-matter shows constant improvement as the work progresses.

# MARKETS.

## Silver.

NEW YORK, Friday Evening, May 22.

| DATE. | London. Pence. | N. Y. Cents. | DATE. | London. Pence. | N.Y. Cts. |
|---|---|---|---|---|---|
| May 16 | 49⅛ | 107⅛ | May 20 | 48 15-16 | 107 |
| 18 | 49 | 107¼ | 21 | 49 | 107⅛ |
| 19 | 48 15-16 | 107 | 22 | 49⅛ | 107⅛ |

The silver market has fluctuated but little during the week, though, with the more warlike news from London, the price of silver has become firmer, for reasons already explained. Of course, should war actually take place, the price of silver would probably advance on account of the advance in Indian exchange. On the other hand, should there be no war, and should our own government be obliged to stop the monthly purchase of silver, we should have more to export, and the price would probably decline, for a time at least.

*Foreign Bank Statements.*—The governors of the Bank of England, at their regular weekly meeting to-day, made no change in the bank's minimum rate of discount, and it remains at 2½ per cent. During the week, the bank gained £180,664 bullion; and the proportion of its reserve to its liabilities was reduced from 50 9-16 to 50 1-16, against 48 3-16 per cent at this date last year. May 21st, the bank gained £42,000 on balance. The weekly statement of the Bank of France shows gains of 6,582,000 francs gold, and 2,140,000 francs silver. At London, bar silver was 1-16d. higher at 49d. per ounce.

The government bought during the week 600,000 ounces of silver; the price is not stated.

**Copper.**—Our copper market is quiet but firm, and most of the conditions exist that should bring an advance, both in this country and in Europe.

We quote Lake, 11½@11¾c.; Parrot Electrolytic, 11·20@11·40c.; Orford, 11@11⅛c.; other brands, 10⅞@11c.

Chili Bars have steadily declined as follows: May 16th, £44 17s. 6d.; 18th, £44 12s. 6d.; 19th, £44 7s.

6d.; 20th, £44 7s. 6d.; 21st, £44 7s. 6d., and to-day, at the close of business in London, £44 2s. 6d. This decline is said to be due to the large shipments from this country. These have already amounted this month to the equivalent of 7,000,000 pounds of copper, mostly in matte.

This immense export is due largely to the delays in bringing forward copper from the West during the earlier months of the year. The English market is evidently overestimating the amount of copper it will receive from this country during the present year. The contracts already made abroad are about as follows:

| | Pounds. |
|---|---|
| Anaconda | 30,000,000 |
| Other Montana copper | 11,000,000 |
| Calumet & Hecla | 20,000,000 |
| Copper from imported pyrites | 3,000 000 |
| Total | 64,000,000 |

If our production should equal that of last year, or say, including copper from imported pyrites, 145,000,000 pounds, this would leave but 81,000,000 pounds for home consumption should not another contract be made abroad. The consumption here is certainly increasing, manufacturers are not carrying any stocks, and the producers commenced the year with light stocks, so that there is every probability that our home markets can absorb 80,000,000 pounds. The English market had better revise its estimates and make a note of this.

Calumet & Hecla has made contracts with a number of manufacturers for deliveries during June, July, and August at 11½ cents. Some of the other Lake companies have done the same, but there is a disinclination to take orders at those prices for future deliveries.

**Tin.**—This metal has remained stationary at 18·20c. for spot Straits, while the London quotations cabled to the Metal Exchange to-day are £84 17s. 6d. spot Straits, and £84 5s. three months. These prices are not so low as during the week or at the date of our last issue.

**Lead.**—This market is exceedingly quiet, with sales of 300 or 400 tons Desilverized at 3·65c., and we quote 3·65@3·70c. There is nothing worthy of mention in this market at present, but we may have more next week.

Soft Spanish was quoted to-day in London £10 17s. 6d.

Messrs. John Wahl & Co., of St. Louis, telegraph to us as follows to-day:

Business during the week has been very quiet, and sales of a retail character. Of Chemical, 200 tons were sold at 3·42½c., for August at 3·67½c.; 200 tons of Corroding were sold at 3·47½@3·50c.

Messrs. Everett & Post, of Chicago, telegraph to us as follows to day:

The market remains about the same—if any thing, a shade weaker, for Common lead at 3·45c., 3·47½c. asked. Sales of Refined and Corroding at 3·50c. for May and June.

**Spelter.**—There is nothing of note in this metal. We continue to quote 4·15@4·40c. for Domestic, according to brand.

Silesian Spelter in London to-day was quoted £13 12s. 6d.

**Antimony.**—Quiet at 9½c. for Hallett's, 9¾@10c. nominal for Cookson's. In London, Hallett's remains steady at £38.

## IRON MARKET REVIEW.

NEW YORK, Friday Evening, May 22.

**American Pig.**—There is an entire lack of interest in this market, and prices remain steady and firm by the best makers at about $18 for No. 1, $17 for No. 2, and $16 for Gray Forge, for standard Lehigh brands, with fluctuations of about 50c. up or down for special brands or inferior qualities. The weak financial position of some of the furnace companies is a disturbing element that will probably prevent any advance in prices for some time; but makers are generally convinced that the bottom is reached, except where necessity obliges makers to sell, even at less than cost, to realize.

**Scotch Pig.**—About 1100 tons have arrived during the week. Some of it will probably go into store. We continue to quote prices ranging from $21 for Coltness to $18 for Eglinton, with the usual intermediate prices for other brands. In Glasgow to-day, prices, as cabled to the Metal Exchange, were: 51s. for Coltness, 42s. for Eglinton; warrants, 42s.

**Steel Rails.**—The steel mills are pretty well supplied with orders, and are firmer in their prices; $27 may be considered the price at the Eastern mills. We hear of 3000 tons Bethlehem rails sold at $28 at tidewater, and 2000 tons of North Chicago rails sold at Chicago. The mill price there is about $29@$30.

### Philadelphia. May 22.

[From our Special Correspondent.]

*Pig-Iron.*—If the actual transactions of the past six days could be scheduled as to quantities and prices, it would show that demand has fallen off, but that prices are firmer, particularly on irons that are most frequently asked for. Two or three lots of well-known No. 1 brands were sold as high as $18.50. There are offers in the market for first-class No. 1 Foundry at $18.25. There is more selling under $18 than above it. Several inquiries are to be made for No. 2, and two or three offers have been made for iron at $16.50, for which $17 is asked. The mill-owners have not booked enough business yet to justify them in other than their old policy. Very few care to pay over $15.50. There is plenty of iron to be had below that. Two or three furnace companies are endeavoring to negotiate for Southern Forge. One Allentown furnace blows in soon. Two other furnaces will blow out in the course of ten days. A great deal depends upon how things go in the West. At present, the indications are, that the manufacturers will inaugurate a lock-out. The demand for material is by no means urgent, and the stocks of crude iron particularly are large enough for all probable requirements.

*Foreign Irons.*—There have been no arrivals this week except of two lots of Spiegeleisen. There are inquiries for Bessemer, but no transactions. Buyers decline to pay over $19, and sellers decline to meet these terms.

*Muck-Bars.*—Quotations range from $26@$27.50. There is very little doing.

*Blooms.*—Both anthracite and charcoal blooms hold their own, and less product is turned out.

*Merchant Iron.*—Refined Bars command $1.80; Medium, $1.70@$1.60; Common, $1.50@$1.45 at some mills. There is a very active competition for all the business going. No large sales have been made; no one cares to buy except for immediate requirements. All things have a rather favorable outlook, notwithstanding the prospects of a suspension in the West. People here intend to wait and see what actually takes place. Some manufacturers say they have conditional orders, based on a suspension in the West.

*Nails.*—Nails are nominally $2.20, but are selling at $2.15. There is no serious increase of stocks, and it is expected that at next week's meeting some important business will be transacted. Building operations are pushed along with the utmost vigor, and the chances are, that prices will be held at about $2.15, although in small lots $2.20 and $2.25 are paid.

*Plate and Tank-Iron.*—Some 200 tons of Plate and Tank-Iron were ordered this week, and there are negotiations for a good deal more, which will be closed by Saturday. The consumers of plate and tank are doing as all others are doing, and hence are obliged to come into the market frequently.

*Sheet-Iron.*—Card rates are unchanged, and Galvanized is the subject of more inquiry than any other kind.

*Wrought-Iron Pipe.*—There has been no change in the situation.

*Cast Pipe.*—The mills are all busy.

*Merchant Steel.*—There is a moderate demand at old prices.

*Structural Iron.*—There are rumors that the combination prices have been departed from in some instances for beams.

*Steel Rails.*—No large orders have been placed, but there is a fair run of small orders, which keeps the capacity going. Small orders are booked at $27.50. Large orders would be readily taken at $26. An average week's business has been done. There are Western and Southern inquiries in the market, but buyers are hard to put down.

*Old Rails.*—A good many rails can be sold for immediate delivery at $17; but spot stocks are light.

*Scrap.*—The scrap-yards are doing very little business. Selected is $17.50@$18.50; Cargo, $16@$17; Steel Scrap, $19@20; Horseshoes, $22@23; Car-Wheels, $15.

## COAL TRADE REVIEW.

NEW YORK, Friday Evening, May 22.

### Anthracite.

Up to the end of April, according to Mr. Jones's statistics, given last week and repeated for convenience to-day, the production was 7,771,524 tons, or 730,407 tons less than to the corresponding date last year.

The following table shows in round numbers the excess of each company over its allotment at the end of April. The total allotment was 7,200,000 tons; production, 7,771,524 tons.

| | | | |
|---|---|---|---|
| Philadelphia & Reading Railroad | 38·85 per cent | + | 54,000 |
| Lehigh Valley Railroad | 19·60 " " | + | 9,000 |
| Delaward Lack. & Western | 16·05 " " | + | 54,000 |
| Delaware & Hudson | 11·00 " " | — | ..... |
| Pennsylvania Railroad | 8·00 " " | + | 405.000 |
| Pennsylvania Coal Company | 5·00 " " | — | 2,000 |
| Erie Railroad | 1·50 " " | + | 53,000 |
| | | + | 573,000 |

The Pennsylvania Coal Company 2000 tons and the Delaware & Hudson a few hundred tons short, are the only companies that have not exceeded the quota. The Pennsylvania Railroad is forging ahead at a rate that promises trouble, for the prospects at present are that the thirty millions can not be marketed. And if the Pennsylvania Railroad is allowed to take 1,000,000 tons more than its share, the other companies will scarcely be happy or resigned.

The anthracite trade in this center is extremely dull, and prices are off from last week's quotations.

For standard hard and free-burning coals, we quote f. o. b.

| | |
|---|---|
| Broken and Egg | $3.15@$3.35 |
| Stove | 3.65@ 3.85 |
| Chestnut | 3.20@ 3.50 |
| Pea, soft | 2.00@ 2.50 |
| " hard | 1.85@ 2.25 |

Stove, broken, and pea coal are the sizes at present in greatest general demand, though we hear of Stove coal sold alongside, Brooklyn, at $3.75, equal to $3.55 @$3.60 f. o. b.

The Board of Education has contracted for the delivery of about 12,000 tons of coal in cellars of schoolhouses in this city and limits at $4.02 per ton of 2240 pounds. The contract calls for 2500 tons of stove, a little chestnut, and the rest broken. An excellent authority says the cartage will average 75 cents a ton. The vessel rate will be at least 15 cents, which will leave an average price of $3.12 f. o. b. It is said that the Board of Education claims the right to see the bills of lading and to have them verified by the Delaware & Hudson Canal Company. J. D. Kurtz Crook goes upon the bond of the contractor.

Coxe Brothers' Beaver Meadow Colliery, is again at work, the men having accepted the company's terms.

The Susquehanna & Western Railroad will handle about a million tons this year, and it is said to be competing with the Delaware & Hudson Canal Company and Pennsylvania Coal Company in territory formerly monopolized by these companies.

A dispatch to a New York daily from Rondout, New York, says that last season many Eastern manufacturers, customers of the Delaware & Hudson Canal Company, changed their grates to burn bituminous coal, and now retain them. The company has also lost other customers, among them a manufacturing company having five factories and burning 20,000 tons a year. There are now 270 canal-boats waiting to be unloaded, and some of them have been here two weeks. Few boatmen have been so fortunate as to make two trips, although the canal opened on April 6th. River towing is dull, and many tugs have not yet started for the season and are lying idle in Rondout Creek. On the 270 loaded boats lying here, are 810 people, whom merchants have to feed on credit, besides 540 horses and mules.

We are inclined to think this is an exaggeration, and it may have found its origin in Wall street.

The Western business is utterly demoralized. For particulars, see the letters of our well-informed Buffalo correspondents.

Anthracite has been sorely pressed in its markets by bituminous coal, as these pages have frequently testified, but it is now meeting with a new and vigorous rival in crushed coke. This, burning without smoke and being cleanly and cheap, is likely to become a very formidable competitor throughout the West. At present, its use is but little known and its influence not at all appreciated.

Mr. John H. Jones, official accountant, publishes the following statement of the anthracite coal tonnage for the month of April, 1885, compared with the same period last year. This statement includes the

entire production of anthracite coal, excepting that consumed by employés, and for steam and heating purposes about the mines :

| COMPANIES. | April, 1885. | April, 1884. | Difference. |
|---|---|---|---|
| Phila. & Reading RR... | 905,550 | 1,062,357 | D. 156,806 |
| Lehigh Valley RR..... | 438,291 | 565,815 | D. 127,332 |
| Del., Lack. & West. RR. | 295,227 | 459,571 | D. 164.343 |
| Del. & Hud. Canal Co.. | 268,338 | 315,332 | D. 46,994 |
| Pennsylvania RR ..... | 273,559 | 257.455 | I. 16,103 |
| Pennsylvania Coal Co. | 109.567 | 136,041 | D. 26,473 |
| N. Y., L. E. & W. RR... | 45,691 | 31,638 | I. 14,052 |
| Total ..... ..... | 2,336,223 | 2,828,209 | D. 491,986 |

| COMPANIES. | For Year 1885. | For Year 1884. | Difference. |
|---|---|---|---|
| Phila. & Reading RR... | 2,851,060 | 3,019,798 | D. 168,738 |
| Lehigh Valley RR..... | 1,420,056 | 1,717,069 | D. 297,013 |
| Del., Lack. & West. RR. | 1,209,519 | 1,454,364 | D. 244,845 |
| Del. & Hud. Canal Co.. | 791,791 | 923,778 | D. 131,987 |
| Pennsylvania RR ..... | 979.845 | 898,900 | I. 80,945 |
| Pennsylvania Coal Co.. | 358,259 | 382,686 | D. 24,426 |
| N. Y., L. E. & W. RR... | 160,994 | 105,336 | I. 55,658 |
| Total..... .. | 7,771,524 | 8,501,931 | D. 730,407 |

The stock of coal on hand at tide-water shipping points, April 30th, 1885, was 420,564 tons ; on March 31st, 1885, 431,424 tons ; decrease, 10,860 tons.

## Bituminous.

There has been rather more business during the past week, but this trade is also extremely dull, and prices are matters of negotiation. We continue to quote Cumberland and Clearfield at $2.75@$3 for round lots f. o. b. Small lots occasionally pay a little more, and "pool" continues to be quoted, but disregarded. When the sinners come to the bar of the pool road to claim their drawback, they receive it, and no impertinent questions are asked.

The pool, unlike justice, is both deaf and blind.

Recent contracts in New York State have been made on the basis of $1.50@$1.60 for coal delivered to Newark on the Northern Central and West Shore roads. This would give about 75 cents for coal at the mines, and 3 mills per ton-mile for carrying a little over 250 miles. It is said that the West Shore does its share toward competing with the New York Central. The same carrying rate as charged by the Pennsylvania Railroad would put this coal at Albany for less than $2.25. It is said that considerable all-rail coal is going to the East via this route. This is but another way of sailing around the famous Eastern pool. (The tribulations of the Western pools are sung in our Buffalo correspondence.) The effect of this rear attack will be hard, not only on anthracite, but on Cumberland, though the competition is said to be aimed chiefly at the Vanderbilt lines that have made up the Beech Creek outlet.

The Inman Steamship Line contract of about 40,000 tons, and 15,000 tons sugar-house contract, have gone to a Clearfield firm.

There is, of course, much grumbling in the trade about favoritism.

A receiver has been appointed for the Buffalo, New York & Philadelphia Railroad Company. It is stated by parties interested that the receivership will place the road in good shape to enter the contest over the soft coal traffic against the Rochester & Pittsburg and the Erie, which, they think, is sure to come. The receivership will not greatly affect the coal business of the company. The Fairmount Coal and Iron Company and the Northwestern Coal and Iron Company are separate organizations. The Fairmount Company has money in bank already to pay its fixed charges. The Northwestern stock is nearly all owned by the Buffalo, New York & Philadelphia.

### Philadelphia. May 22.

[From our Special Correspondent.]

Freights have crept up steadily to $1.10@$1.15 to Boston, and every thing else has remained *in statu quo* for a week past. The local trade is so dull that some dealers resort to all sorts of inducements to make consumers lay in their supply. One concern gives a watch and chain with a five-ton order, and chromos will soon be in demand among retailers for distribution to buyers by the ton. There is an accumulation of some sizes at tide-water, but it is only slight and owing entirely to scarcity of vessels. Broken coal is cleaned out. Taking it altogether, the demand is fully up to the restricted production, and, by the time buyers want coal shipped, will be lively. There will be no great excess on hand unless they wait beyond August, when full-time will be the rule.

### Buffalo. May 21.

[From our Special Correspondent.]

The anthracite coal trade is thoroughly demoralized at this point. There appears to be no concert of action on prices. It is very difficult to obtain any information from parties engaged in the business. For the retail trade, Grate has been offered at $4, Stove at $4.50, and Chestnut about $4 per net ton, delivered within city limits ; other sizes in proportion. It will be noticed that these rates are 70 cents below those agreed upon May 1st last. Rumors are in circulation that even lower prices have been made. The outlook is deemed to be dismal and fixing prices apparently a farce. It is claimed that small dealers sold retail lots at wholesale figures, and that they required the usual reduction, not on retail but on the wholesale prices, to be made to them. As a merchant said, "So the coal trade is whittled to pieces."

A meeting of the Buffalo bituminous coal pool commissioners was held yesterday, at the office of the arbitrator, Mr. MacFarlane, to discuss results, etc. It appeared that recent developments have shown a disposition on the part of some of the producers to cut rates, and it is considered within the possibility that there may be a sad awakening one of these days that will bring a big job for the arbitrator. The *casus belli* is the New York Central supply contract of 100,000 tons, which was given in equal shares to Bell, Lewis & Yates and J. Langdon & Co., at $1.75 a ton, five cents under the pool price. As Langdon & Co. have no soft coal of their own, the pool commissioners think they see a mare's nest of considerable size. The matter needs attention at once ; for the Michigan Central contract for from 25,000 to 30,000 tons stands in danger of going the same way and at the same figures. The pool bids are all in at $1.80, the regular price, but so far have not attracted the favorable attention of the Michigan Central magnates. The two contracts go together usually, and as Langdon & Co. are known as Vanderbilt sympathizers, they rather expect to be remembered at this time.

The New York, Ontario & Western contract, which was secured by parties in Buffalo last season, has been let to Mr. Chipman, of Elmira, and it is understood that the product of the Clearfield region will be used. The supply of the Kingston & Pembroke road, amounting to about 4000 tons, has been awarded to Bell, Lewis & Yates at $3.10 a ton, delivered on the docks at Kingston, Ont. This coal goes from the mines to Rochester, thence to Charlotte, and by vessel to Kingston. The price includes 60 cents per ton duty, which makes the net price $2.50. This contract does not come under the rules of the association, as all cargoes are free out of Buffalo or Rochester harbors.

The sub-committee of the Western Anthracite Coal Association finished its labors last Thursday evening. The committee was : A. R. Lee, of W. L. Scott & Co., Erie, Chairman ; Thomas Hodgson, of Pennsylvania, Buffalo, Secretary ; S. C. Schenck, of the Delaware, Lackawanna & Western, Toledo ; Batcheler, of the Delaware & Hudson, Cleveland ; J. J. Albright, Jr., of the Philadelphia & Reading, Buffalo ; J. H. Horton, of Lehigh, Buffalo ; S. W. White, of A. Langdon & Co., Buffalo ; J. J. McWilliams, of the Delaware, Lackawanna & Western, Buffalo ; Van Zandt, of Boyd, Stickney & Co., Harrisburg ; C. M. Underhill, of J. Langdon & Co., Buffalo. The summer rates for points in the West and Southwest were fixed as follows :

COMBINATION PRICES FOR ANTHRACITE.

At a meeting of the sub-committee, appointed by the general committee, to fix prices at local points west of Buffalo, Salamanca, and the bridges, held in Buffalo May 14th, 1885, the following interests were represented : Delaware, Lackawanna & Western Railroad, Pennsylvania Railroad, Boyd, Stickney & Co., Delaware & Hudson Canal Company, Lehigh Valley Coal Company, Pennsylvania Coal Company, Philadelphia & Reading Railroad, A. Langdon & Co., and J. Langdon & Co.

The following points on the Lake Shore & Michigan Southern tariff sheet, dated May 1st, 1885, have been changed to read as below, which rates, added to the Buffalo car prices, will give the delivered prices at same : Buffalo car prices—Grate, $4.15 ; Egg, $4.25 ; Stove, $4.70 ; Chestnut, $4.50 ; Pea, $3.70 per ton of 2240 pounds.

Kokomo, Ind., $2.25 above Buffalo car price ; East St. Louis ; Alton, Ill. ; Bellaire, Ohio ; Bridgeport Belmont County, Ohio ; Bucyrus, Ohio ; Cambridge City, Ind. ; Circleville, Ohio ; Delphos, Ohio ; Lancaster, Ohio ; Richmond, Ind. ; Washington Court-House, Ohio ; Xenia and Zanesville, Ohio, $2 above Buffalo car price ; Newark, Ohio, and Seneca, Ill., $1.75 above Buffalo car price ; Canton, Ohio, $1.50 above Buffalo car price ; Titusville, Pa., 85c. above Buffalo car price ; Warren, Pa., 60c. above Buffalo car price ; Akron, Ohio, $1.25 above Buffalo car price.

*Resolved*, That the prices at all other points on the Lake Shore & Michigan Southern tariff, above referred to, except Bunker Hill, Ill. ; Butler, Ill. ; Charleston, Ill., $3.75 ; Coal Bluff, Ind., $2.65 ; Dorsey's, Ill., $3.75 ; East Liverpool, $2.50 ; Foxburg, Pa., $2.25 ; Gillespie, Ill., $3.75 ; Green Castle, Ind., $3.02 ; Hillsboro, Ill., $3.75 ; Kansas, Ill., $3.47 ; Wellsville, Ohio, $3 ; Windsor, Ill., $3.75 ; Litchfield, Ill., $3.67 ; Martin's Ferry, $2.50 ; Mattoon, Ill., $3.75 ; Nokomis, $3.75 ; Pana, Ill., $3.75 ; Paris, Ill., $3.30 ; Parker, Pa., $2.25 ; Reno, Pa., $1.25 ; Shelbyville, Ill., $3.75 ; Steubenville, Ohio, $3 ; W. Wheeling, Ohio, $2.50 (which are governed by arbitrary rates from other points), be Buffalo circular, plus the freight as therein named.

*Resolved*, That prices at all points not already established be Buffalo circular, plus the regular published rail tariffs.

Adjourned to call of the chair.

A. R. LEE, Chairman.

THOMAS HODGSON, Secretary.

The following is the tariff resolution referred to in my last letter :

*Resolved*, That the Buffalo coal tariff of May 1st, 1884, from Salamanca, Buffalo, and the bridges be adopted for the summer of 1883, commencing May 1st, 1885, and ending October 31st, 1885, with the following exceptions :

| | Per ton. | | |
|---|---|---|---|
| Chicago, Ill..... | $1.75, | May 1st to | October 31st. |
| Erie, Pa ... ..... | .75 | " | " |
| Cleveland, O..... | .75 | " | " |
| Green Springs Jct, O..... | 1.00 | " | " |
| Leipsic, O. (when for C., H., and D. points) ..... | 1.00 | " | " |
| Akron, O .. ..... | 1.25 | " | " |
| Mansfield, O ..... | 1.50 | " | " |
| Galion, O..... | 1.50 | " | " |
| Marion, O..... | 1.50 | " | " |

and that no other changes be made in tariff rates without a confirmation by the roads in interest at a meeting to be called for the discussion of any proposed changes.

The work on the breakwater extension is favorably progressing ; seven of the thirteen cribs are ready for sinking, and the job was begun yesterday.

Sealed proposals will be received until June 1st, at three o'clock P.M., for furnishing the Buffalo City Water-Works with 10,000 tons of anthracite coal, to be delivered at the pumping station.

The coal shipments by lake from May 14th to 20th inclusive aggregated 68,280 tons, namely, 16,870 to Chicago, 12,700 to Duluth, 25,760 to Milwaukee, 7900 to Superior City, 1100 to Sandusky, 650 to Muskegon, 2200 to Racine, and 110 to Kenosha. Freight rates unchanged—namely, 50 cents to Chicago and Milwaukee, 40 cents to Duluth and Superior City, 60 cents to Kenosha and Muskegon, 55 cents to Racine, and 25 cents to Sandusky.

A large fleet of vessels arrived here Saturday, Sunday, and Monday last, many of which were already chartered, and as a consequence there was, and is, considerable delay in loading coal as stocks, for shipments are very light and come forward slowly. Grain freights are thoroughly demoralized (one and a quarter cents per bushel, 60 pounds, for corn Chicago to Buffalo), and many sail vessels will be laid up according to reports now prevalent.

A propeller came near breaking the fuel combination here last Saturday, but the arrangement with the owners of a certain dock to load her at a reduction was discovered and further transactions of that sort stopped.

Vessel agents were asking 75c. for coal to Chicago and Milwaukee at noon to-day. No charters have been made for forty-eight hours. Several propellers left light for Duluth this morning in preference to taking 40c. freight and waiting for cargoes.

Shipments of coal by canal include two loads of dust to Syracuse at 70c. per gross ton f. o. b., captain to pay one shilling unloading, and one load of coal to Oriskany at 75c. net ton, captain to pay loading and unloading. Nominally asking $1.25 per net ton to New York, and $1 to Albany, captain to pay loading and unloading.

A few Duluth items may be interesting. The Northwestern Fuel Company will receive 300,000 tons of coal at Washburne, and the Omaha Railroad Company

30,000 tons this season; new additional docks are proposed at this point. On May 15th, the propeller Hecla arrived at Duluth with 1400 tons of coal for the Northwestern Fuel Company, the first vessel of the season; no reports of arrivals received since. The advertised prices of coal at Duluth are: $6.60 for Stove, $6.45 for Nut, $6.20 for Egg: and $6.10 for Grate, delivered.

[From an Occasional Correspondent.]

My last made such a sensation that I began to fear we had made a mistake in letting on the light, but a change of any kind affecting the coal trade can not be for the worse, and perhaps the publication of facts will do no harm.

Among the anthracite dealers, there is a feeling that the business is going to the "demnition bow-wows" very fast, and all are willing to give it a kick.

As coal is selling at retail at seventy-five cents below agreed rates, it may be taken for a fact that, in some way, the companies give about that discount from the circular to their favored customers, as it is impossible to unload, screen, pay expenses, and deliver at less than one dollar, the agreed difference between wholesale and retail prices, so that it is easy to work out the problem. As to who were the "original Jacobs" in the matter of cheap coal, it is hard to tell, although the blame is cast on the "scavenger yard," but as more than one agent here had orders not to get "left," it mattered little, as it was certain some pretext would be found.

There is very little doing in the wholesale way. Western dealers will take their cue from the Milwaukee water-works contract, which was taken at a price that—counting interest—will not leave much of a margin at seventy-five cents below circular. Some believe that the "racket" has commenced so lively and with so much spirit that it will be impossible to prevent a fight, but I doubt it. The dominant mind in our matters always gains a little under present conditions, and once gained always holds. The others are no match for him.

One can not but admire good tactics in business, and in the soft-coal trade our friends Messrs. Bell, Lewis & Yates are entitled to all we can say in that line. They seem to have outfigured all the rest of the soft coal men completely. One would think it impossible to build up a monopoly in the cheap soft coal that comes here, and while Bell, Lewis & Yates have not exactly succeeded in doing that, they have come so close to it that their success is simply wonderful. I judge that, in some way, they have the inside track, and have succeeded in cutting down margins to other dealers to so great an extent that the others do not care to fight for business, while Bell, Lewis & Yates have such an enormous tonnage they can probably afford to work cheap, although I opine their margin is a comfortable one. At any rate, it is refreshing to see some concern doing handsomely.

The "wise men of the East" are to be here next week. They will look extremely wise and indulge in many words. Some of them will say, "Gentlemen, there must be a change for the better, or else we shall make a change for the worse." (That chestnut is nearly as old as the "rope of sand.") Others will declaim against some little chap that sold a car of coal somewhere at prices away above theirs, and they will roar at the little cuss like a bull of Bashan. Finally, some one will offer a resolution that the circular prices as adopted at the last meeting be continued for the month of June, and that each member telegraph his agent to firmly maintain these prices. This will be adopted unanimously and the meeting will adjourn. They are "amoosin' little cusses."

**Boston.** May 21.

[From our Special Correspondent.]

The anthracite tonnage for May will exceed the sales for May, 1884. Although business is done in a quiet way, a good deal of coal is disposed of. In all markets dependent on Boston, retail stocks are light. Dealers are not stocking up as yet, but continue to buy cargo lots, which are readily taken by the consumptive demand. Many dealers are running so close to the wind that there has been a demand for cargoes afloat. The whole season has been such that practically no coal has been accumulated since the opening of the season. The market is quite firm. The weather has, until now, forced consumers to do their part toward making the anthracite trade good. Will the producers do their part? Any decent adherence to the allotment programme would seem to be all that is necessary. It must be borne in mind that dealers can not be depended upon to buy because freights are low now. The opinion prevails that freights will continue low all summer.

We quote f. o. b. prices as follows:

At Port Richmond, Stove, $3.75@$3.85; Broken, $3.15@$3.25; Egg, $3@$3.15; Chestnut, $3.25; Pea, $2.05@$2.15. Shamokin Stove, $4@$4 30; Egg, $3.50@$3.80; Nut, $3.30@$3.40. Lykens Valley, Broken, $4.90; Stove, $5.40; Egg, $5.15; Nut, $5.15. At New York: Stove, $3.75@$3.85; Broken, $3.25; Egg, $3.25; Chestnut, $3.60; Pea, $2.15@$2.50.

There is no special movement in bituminous coal. Labor troubles are causing uneasiness, and fears are entertained of a general Cumberland strike on a proposition for 10 cents advance. The operators can not pay this and remain on a fair competitive basis with Clearfield. There has already been a strike in the Elk Garden region. Should it become general, parties that have contracted for a large tonnage would be left in bad shape. Now that the Old Colony contract is out of the way—it having been given to both Clearfield and Cumberland operators, with a few thousand tons to Pocahontas—no railroad business remains in New England, unless possibly the all-rail portion of the Boston & Albany contract. So far as the pool is concerned, there has been no visible change. Those who have been bound by the pool do not seem to be able to make better prices than before, and the few who have apparently paid no heed to the pool continue to do the bulk of the business. Those who are losing their business claim that their fidelity to the pool will pay them in the long run. But to outsiders, a contract in hand has the appearance of being worth two next season. We quote f. o. b. prices $2.25@$2.35 at Baltimore and Philadelphia.

There is a steady but quiet movement in gas coal, the bulk of the tonnage having been placed. We hear of $4.10@$4.15 being named as delivered prices, which are very low. Pennsylvania coal is also sold delivered this year for the first time. Some Westmoreland was sold delivered last year, but none before then.

Freight rates are a little firmer. A permanent organization, known as the Vessel Owners and Captains' National Association, was effected at the recent meeting at this port. The plan was evidently well perfected in advance. The principal movement made is the appointment of a coasting commission of five members, who will attempt the important undertaking of regulating the lowest rates for coal and ice. While it is unfortunate that rates should remain so low as not to pay actual expenses on a great many trips, it must be remembered that the extent to which all-rail coal is brought to New England is no small factor. It is estimated that fully three times as much coal will be delivered to New England manufacturers by all-rail this year as ever before, particularly to points in Western Massachusetts. Several of the leading lines are competing for this business. Perhaps they will refuse it when general railroad business improves, but many believe that all-rail coal shipments are bound to increase. Water freights can not offer more severe competition than now.

We quote water freights:

New York, 80c.; Philadelphia, $1@$1.10; Baltimore, $1.20; Newport News, $1.10@$1.15; Richmond, $1.20@$1.25; Cape Breton, $1.50@$1.75.

The retail demand for May is better than usual, but is not large. Prices are unsettled, but are practically down to a basis of $5 for Broken and $5.50 for Stove. Contracts for Broken to be delivered during the year have been taken at about $4.55. We quote:

| | | |
|---|---|---|
| White ash, furnace and egg | | $5.00 |
| " " stove and nut | | 5.50 |
| Shamokin, egg | | 6 00 |
| " stove | | 6.25 |
| Lorberry, egg and stove | $6.50@ | 7.00 |
| Franklin, egg and stove | | 7.50 |
| Lehigh, furnace, egg, and stove | | 5.50 |
| " nut | | 5.75 |

**New Orleans.** May 18.

[From our Special Correspondent.]

The coal market shows no improvement in prices, although there is a tendency toward an advance, on account of the continued small stock of Pittsburg coal on hand and the uncertainty of getting out an additional run from the mine this spring. The river is unnavigable for coal-boats at Pittsburg, and even at Louisville, where there is a good stock destined for this market, the river is falling, and may be too low to permit of the tow-boats now *en route* from here, to return with tows.

As compared with last year, there are some 80 boats less on hand now than on May 18th, 1884. The demand from the sugar-planters is not equal to that of last year.

## STATISTICS OF COAL PRODUCTION.

**Production Anthracite Coal** for week ended May 16th, and year from January 1st:

| Tons of 2240 lbs. | 1885. Week. | 1885. Year. | 1884. Week. | 1884. Year. |
|---|---|---|---|---|
| P. & Read. RR. Co.. | 225,397 | 3,508,122 | 208,987 | 3,589,600 |
| L. V. RR. Co..... | 132,386 | 1,710,698 | 172,163 | 2,007,143 |
| D., L. & W. RR. Co. | 75,572 | 1,359,506 | 113,121 | 1,650,320 |
| D. & H. Canal Co.. | 66,432 | 1,136,270 | 111,092 | 1,214,083 |
| Penna. RR.: | | | | |
| N. & West Br. RR. | 23,855 | 414,364 | 10,688 | 295,596 |
| S. H. & W. B. RR. | 6,756 | 67,254 | 2,048 | 75,347 |
| P. & N. Y. RR.... | 7,851 | 124,833 | 17,144 | 172,716 |
| Penna. Coal Co..... | 25,385 | 413,147 | 38,021 | 400,880 |
| Penna. Canal Co.... | 14,371 | 43,393 | 18,766 | 68,471 |
| Shamokin Div., N. C. RR ..... | 15,900 | 331,725 | 22,893 | 353,792 |
| Lykens Valley..... | 10,000 | 179,998 | 12,425 | 181,694 |
| Total... ... .... | 603,905 | 9,289,310 | 827,348 | 10,009,642 |
| Increase.. ..... | ..... | ..... | ..... | ..... |
| Decrease. ..... | 223,443 | 720,332 | ..... | ..... |

The above table does not include the amount of coal consumed and sold at the mines, which is about six per cent of the whole production.

Production for corresponding period:

| | | | |
|---|---|---|---|
| 1880..... | 7,939,037 | 1882..... | 9,178,604 |
| 1881..... | 9,332,027 | 1883..... | 10,412,742 |

**Production Bituminous Coal** for week ended May 16th and year, from January 1st:

Tons of 2000 pounds unless otherwise designated.

EASTERN AND NORTHERN SHIPMENTS.

| | 1885. Week. | 1885. Year. | 1884. Week. | 1884. Year. |
|---|---|---|---|---|
| Philadelphia & Erie RR..... | ..... | 11,307 | ..... | ..... |
| *Cumberland Region, Md..... | 65,855 | 938,036 | 71,582 | 894,561 |
| *Barclay Region, Pa. | | | | |
| Barclay RR..... | 3,477 | 95,841 | 8,338 | 133,802 |
| *Broad Top Region, Pa. | | | | |
| Huntington & Broad Top RR..... | 3,832 | 66,209 | 4,518 | 73,677 |
| East Broad Top.... | ..... | ..... | ..... | ..... |
| Clearfield Region, Pa. | | | | |
| Snow Shoe..... | 2,840 | 69,638 | 412 | 75,455 |
| Karthaus (Keating) | 1,389 | 52,211 | 1,908 | 4 579 |
| Tyrone & Clearfield | 53,472 | 1,167,347 | 77,969 | 1.127,193 |
| Alleghany Region, Pa. | | | | |
| Gallitzin & Mountain..... | 10,852 | 190,687 | 7,427 | 142,760 |
| Total.....141,717 | | 2,591,276 | 172,154 | 2,452,027 |

WESTERN SHIPMENTS.†

| | | | | |
|---|---|---|---|---|
| Pittsburg Region, Pa. | | | | |
| West Penn RR..... | 6,085 | 106,916 | 4.844 | 112,434 |
| SouthwestPenn.RR. | 2,298 | 41,620 | 3,240 | 63,038 |
| Pennsylvania RR... | 6,168 | 68,518 | 1,951 | 109,857 |
| Westmoreland Region, Pa. | | | | |
| Pennsylvania RR... | 34,300 | 325,873 | 28,069 | 424,851 |
| Monongahela Region, Pa. | | | | |
| Pennsylvania RR... | 4,818 | 73,868 | 1,345 | 61,733 |
| Total..... ..... | 53,669 | 616,795 | 39,449 | 771,913 |
| Grand total ..... | 195,386 | 3,208,071 | 211,603 | 3,223,940 |

*Tons of 2240 lbs.

†Considerable gas-coal shipped East, of which no division is made in report.

## FINANCIAL.

### Mining Stocks.

NEW YORK, Friday Evening, May 22.

The mining market shows some improvement—an upward tendency of prices in many cases, and a larger business, showing an increase of 24,231 shares, as compared with the preceding week. The total sales were 98,054 shares.

The great activity displayed in Bulwer Consolidated is probably due to a rumor stating that some parties interested intended to bring suit against the Standard Consolidated Mining Company. The receiver says that the old management took ore from the Bulwer workings to pay some of its dividends. The management in this city denies this report, and states that the story was circulated at Bodie by a man who wanted to become foreman of the Standard mine, but was refused employment.

Bulwer during the past week ranged from 35@55c., the dealings being 11,250 shares. Standard Consolidated has been firm at from $1.20@$1.40, with sales of 2650 shares. A letter from the mine, just received, states that they have enough ore to keep the mill running two months after it starts up on June 1st. Fourteen assays recently taken from ore from the 500 and 700-foot levels averaged $130 a ton. Bodie Consolidated has been quiet at from $1.50@$1.60, with sales of 850 shares. Consolidated Pacific has declined from 44@25c., closing at 30c.; sales, 1800 shares. Plymouth Consolidated showed the usual business and prices—$15.63@$16.75. Green Mountain had a sale of 200 shares at 50c.

Business in the Colorado stocks continues to dwindle. ut four companies show sales this week. Iron Silver,

# NEW YORK MINING STOCKS.

## DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. | | | | | | | | | | | | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May 16. | | May 18. | | May 19. | | May 20. | | May 21. | | May 22. | | |
| | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Alice, Mon. | 2.05 | ..... | 2.00 | ..... | 2.00 | ..... | 2.00 | ..... | 2.00 | ..... | ..... | ..... | 950 |
| Amie Con., Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Argenta | ..... | ..... | ..... | ..... | ..... | ..... | .12 | .11 | .14 | ..... | .12 | ..... | 1,000 |
| Bassick, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Belle Isle, Ne. | .30 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,200 |
| Bodie Cons., Ca. | ..... | ..... | ..... | ..... | 1.55 | 1.50 | ..... | ..... | ..... | ..... | 1.60 | ..... | 800 |
| Breece, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bulwer, Ca. | ..... | ..... | .40 | .35 | .43 | .40 | .50 | .45 | .55 | .50 | .50 | .45 | 11,250 |
| California, Ne. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cal. & Hecla, Mich. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Castle Creek | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chollar | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Chrysolite, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Colorado Central | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cons. Cal. & Va., Ne. | 1.70 | ..... | 1.55 | ..... | 1.70 | ..... | 1.95 | 1.75 | 2 15 | 1.95 | 2.30 | 2.25 | 6,465 |
| Crown Point | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Dunkin, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Eureka Cons., Ne. | 6.50 | ..... | ..... | ..... | 7.13 | 6.88 | 7.13 | 7.00 | 7.00 | 6.88 | 6.00 | ..... | 900 |
| Father de Smet, Dk. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 3.00 | ..... | 100 |
| Findley, Ga. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gold Stripe, Ca. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Gould & Curry, Ne. | ..... | ..... | ..... | ..... | 1.90 | ..... | 2.50 | ..... | ..... | ..... | ..... | ..... | 300 |
| Grand Prize, Ne. | ..... | ..... | ..... | ..... | ..... | ..... | .50 | ..... | .50 | ..... | .50 | ..... | 1,600 |
| Green Mountain, Ca. | 50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .50 | ..... | ..... | ..... | 200 |
| Hale & Norcross, Ne. | 8.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 7.50 | 7.25 | 500 |
| Hall-Anderson, N. S. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Homestake, Dk. | 11.88 | ..... | 13.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 115 |
| Horn-Silver, Ut. | 1 85 | ..... | 1.90 | 1.85 | 1.90 | 1.85 | 1.85 | ..... | 1.95 | 1.85 | 2.00 | ..... | 4,271 |
| Independence, Ne. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Iron Silver, Co. | ..... | ..... | 1.40 | ..... | 1.40 | ..... | 1.40 | 1.35 | 1.25 | ..... | 1.20 | ..... | 1,700 |
| Leadville C., Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Little Chief, Co. | .24 | ..... | .25 | ..... | .25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1,000 |
| Little Pittsburg, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Martin White, Ne. | .55 | .50 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |
| Moulton | ..... | ..... | ..... | ..... | 1.25 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 50 |
| Navajo, Ne. | ..... | ..... | ..... | ..... | 1.35 | 1.25 | 1.25 | ..... | 1.30 | 1.25 | ..... | ..... | 2,500 |
| North Belle Isle, Ne. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ontario, Ut. | 22.50 | 20 38 | 24.00 | ..... | ..... | ..... | 24.50 | 24.13 | 27.00 | ..... | 24.50 | ..... | 658 |
| Ophir | 1 65 | ..... | ..... | ..... | ..... | ..... | 1 75 | ..... | ..... | ..... | ..... | ..... | 200 |
| Plymouth | 16.50 | 16 38 | 16 38 | 16.25 | 16.50 | 16.25 | 16 50 | 16 38 | 16.63 | ..... | 16.75 | 15.63 | 830 |
| Potosi | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Quicksilver Pref., Ca. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| " Com., Ca. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Robinson Cons., Co. | ..... | ..... | ..... | ..... | .40 | ..... | .38 | ..... | .45 | .40 | .50 | .45 | 7,100 |
| Savage, Ne. | ..... | ..... | ..... | ..... | 4.00 | ..... | 4 00 | ..... | 4.50 | 4.10 | ..... | ..... | 525 |
| Sierra Nevada, Ne. | .58 | ..... | ..... | ..... | 1 15 | ..... | 1.15 | ..... | 1 50 | 1.30 | 1.65 | ..... | 1,600 |
| Silver King, Ar. | ..... | ..... | ..... | ..... | 3.50 | ..... | ..... | ..... | 3.95 | ..... | 3.75 | ..... | 230 |
| Spring Valley, Ca. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Standard, Ca. | 1.30 | ..... | ..... | ..... | 1.40 | 1.25 | 1.30 | 1.25 | 1.25 | 1.20 | 1 35 | 1.25 | 2,650 |
| Stormont, Ut. | ..... | ..... | ..... | ..... | .09 | ..... | .09 | ..... | .10 | ..... | .12 | .11 | 1,400 |
| Tip Top, Ar. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Yellow Jacket | 3 10 | 3.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 2.80 | 2.60 | 550 |

## NON-DIVIDEND-PAYING MINES.

| NAME AND LOCATION OF COMPANY. | HIGHEST AND LOWEST PRICES PER SHARE AT WHICH SALES WERE MADE. | | | | | | | | | | | | SALES. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | May 16. | | May 18. | | May 19. | | May 20. | | May 21. | | May 22. | | |
| | H. | L. | H | L. | H. | L. | H. | L. | H. | L. | H. | L. | |
| Albion | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Alta | .50 | .40 | ..... | ..... | ..... | ..... | .40 | .35 | ..... | ..... | .35 | .30 | 2,400 |
| American Flag | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Barcelona, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bechtel Con., c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Belvidere | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Belcher | ..... | ..... | ..... | ..... | 1.30 | 1.25 | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Best & Belcher, c. s. | 3.65 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 60 |
| Big Pittsburg, s. l. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bradshaw, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Bull-Domingo, s. l. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cal., B. H., c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Central Ariz'na, s. | ..... | ..... | .16 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | .20 | ..... | 600 |
| Climax, Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Cons. Imperial | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Con. Pacific | .44 | .40 | ..... | ..... | .39 | .38 | .39 | .28 | .25 | ..... | .30 | ..... | 1,800 |
| Dahlonega | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Decatur | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Durango, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Eastern Oregon | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Goodshaw, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Harlem M. & M. Co. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Hortense, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Kossuth | ..... | ..... | ..... | ..... | .04 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 500 |
| Lacrosse, c. | ..... | ..... | ..... | ..... | ..... | ..... | .10 | ..... | ..... | ..... | .10 | ..... | 3,000 |
| Mariposa Pref., c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| " Com., c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Mexican, c. s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.25 | ..... | ..... | 450 |
| Mono | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| New Pittsburg | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Noonday | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| North Standard, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| N. Horn-Silv'r, s. l. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ori'nt'l & Miller, s. | ..... | ..... | ..... | ..... | .10 | ..... | .12 | .11 | .12 | .11 | .11 | ..... | 7,300 |
| Rappahannock, c. | ..... | ..... | ..... | ..... | .06 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 100 |
| Red Elephant, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Ruby, of Arizona | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Silver Cliff, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sonora Con. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Bodie, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Bulwer, c. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Hite | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| South Pacific | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| State Line, 1 & 4, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| " Nos. 2 & 3, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Sutro Tunnel | .18 | ..... | .16 | ..... | .17 | .16 | .16 | ..... | .18 | .17 | .18 | .17 | 29,400 |
| Taylor Plumas | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Tioga | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Unadilla, s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Union Cons., c. s. | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 1.45 | ..... | 1 55 | 700 |
| Utah | 2.05 | 2.00 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... | 300 |

Dividend shares sold, 50,944. Non dividend shares sold, 47,110.

1700 shares, at from $1.20@$1.40. Little Chief, 1000 shares, at from 24@25c. Lacrosse, 3000 shares, at 10c. Robinson Consolidated had the largest business, at from 38@50c.; sales, 71,000 shares.

The Comstocks remain the favorites, and the assessments so regularly and so largely levied apparently prompt greater interest instead of diminishing it. The prospects of the best of the mines are bad. They are purely assessment propositions. It almost seems, however, as if the booming fever, originated by the Hale & Norcross, had been contagious with most of the Comstock companies, since almost all have shown a considerable advance within the last two weeks. Consolidated California & Virginia shows that our predictions last week of higher prices were correct. The stock went from $1.55@$2.30, closing at $2.25; the business has been smaller, amounting to 6465 shares. Hale & Norcross remained steady, and sold at from $7.25@$8; at San Francisco yesterday, the closing price was $7.12½; sales, 500 shares. Sutro Tunnel continues to show large transactions; 29,400 shares changed hands at from 16@18c. Sierra Nevada has been higher, ranging from 58c.@$1.65, closing at the latter price; sales of 1600 shares. Savage was firm at from $4@$4.50; sales of 525 shares. Sixty shares of Best & Belcher sold at $3.65. Yellow Jacket shows lower prices, opening at $3.10, and closing at $2.60; transactions, 550 shares. Of the other Nevada stocks, Eureka was the most prominent, selling at from $6@$7.13, with sales of 900 shares. Grand Prize went from $1.90@$2.50; this is probably due to the resumption of operations at the mill. Navajo, 2500 shares, at from $1.25@$1.30.

The transactions of Horn-Silver show an increase; 4271 shares were sold, at from $1.85@$2. Ontario shows an upward tendency, ranging from $20.38@$24.50; the transactions have also been larger than for some time past, amounting to 658 shares. The $75,000 dividend declared this week brings the total to date to $6,425,000—a grand showing.

Alice was steady at from $2@$2.05c.; sales of 950 shares. Moulton appears with a sale of 50 shares at $1.25.

Homestake sold at from $11.88@$13; sales of 115 shares. Silver King, at $3.50@$3.95; sales, 230 shares.

A complete summary of the market will be found elsewhere.

The Treasurer of the New York Stock Exchange reports for the year that the Exchange made, over and above all its expenses, $80,635, $40,000 of which goes to the gratuity fund and $40,000 for the benefit of the members. Taking its government securities at par, the Exchange has a surplus of between $600,000 and $650,000.

The following securities were sold at auction in this city May 20th:

$1000 Gaines Coal and Coke Company first mortgage 6 per cent bonds, $660; 500 shares Evening Star Mining Company, $55; 1000 shares Fletcher Gold and Silver Mining Company, $11; 495 shares Shenandoah Iron Company (hypothecated), $100 each, $1600; $3000 Kemble Coal and Iron Company 6 per cent consolidated mortgage bonds, $50.

### Coal Stocks.

The stock market has been well supported under continued adverse conditions. There have been no encouraging occurrences, while the market has had to meet the influence of the Lake Shore report for the first quarter of this year, which shows a deficiency of $62,606 in meeting fixed charges. Never in the history of the company has it failed to meet its fixed charges except in this instance. A receiver has been appointed for the Buffalo, New York & Philadelphia road; the rates on the trunk lines have been still further reduced; the depression in the coal trade has continued, with cutting of prices on large contracts, while other discouraging influences of a more or less serious character have had to be met.

The recorded sales of Lackawanna have been moderate in quantity, at steady and strong prices. Most of the business is the result of matched orders. The public believes the stock to be too high in price under the unprofitable conditions of the coal trade and the gloomy outlook, while speculators have been too severely punished for selling the stock short to touch it while it is so plainly under the control of a pool. The result is, that the actual business in the stock amounts to but a fraction of the reported transactions.

Delaware & Hudson has been quiet but strong under the support of the clique in the stock. It is announced that the directors will declare a dividend of 1½ per cent to-morrow. It is generally believed that this is not from current earnings. With some, this dividend may create favorable impressions; but in parting with this amount of cash, the company only weakens its position at a time when every cent may be useful in carrying it through to times when there will be a profit in the anthracite coal business, sufficient to more than meet the enormous fixed charges of not only this but other companies.

Jersey Central has had a moderate business at strong prices. The strength is given by the announcement that the directors, in accordance with a resolution of the stockholders at the annual meeting, have instructed counsel to endeavor to put a white elephant upon their hands, by proceeding to recover possession of the road. The directors were opposed to the action, as they knew it would be expensive, and that the company has no funds with which to meet it. They also know that the road has no supplies, no capital to work with, large floating indebtedness, and that the line needs considerable repairs and perhaps equipment. To cover this, the stockholders will undoubtedly be called upon for a considerable assessment, provided they get the road, and even then there will be very grave doubts of the road earning its fixed charges.

Reading has been exceedingly quiet. It is said that its report for April will make a very bad showing.

Pennsylvania Railroad, under moderate transactions, has been a shade weak. This is owing to reduced revenues on coal, grain, and, in fact, nearly all of its principal freights.

### Meetings.

The following companies will hold their annual meetings at the times mentioned:

Americus Silver Mining Company, Room 20, Nos. 113 to 115 Broadway, New York City, May 26th, at twelve o'clock M.

Green Mountain Gold Mining Company, No. 61 Broadway, New York City, June 9th, at ten o'clock A.M.

John Duncan Land and Mining Company, Hancock, Mich., June 1st, at two o'clock P.M.

Quincy Mining Company, Room 22, No. 2 Exchange Court, New York City, June 3d, at twelve o'clock M.

Union Mining Company, Room 46, No. 115 Broadway, New York City, June 1st, at twelve o'clock M.

### Dividends.

Camuchin Consolidated Mining Company, of Mexico, has declared a dividend of $2 a share, or $80,000, payable June 1st, to stockholders of record May 25th.

Granite Mountain Mining Company, of Montana,

## COAL STOCKS.

| NAME OF COMPANY. | Par value of shares. | Quotations of New York stocks are based on the equivalent of $100. Philadelphia prices are quoted so much per share. May 16. H. | May 16. L. | May 18. H. | May 18. L. | May 19. H. | May 19. L. | May 20. H. | May 20. L. | May 21. H. | May 21. L. | May 22. H. | May 22. L. | Sales from May 16th to May 22d inclusive. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Barclay Coal | | | | | | | | | | | | | | |
| Cameron Coal | 50 | | | | | | | | | | | | | |
| Col., C & I | 10 | | | 11½ | 10½ | | | | | | | 10 | | 325 |
| Ches. & O. RR | 100 | | | | | | | | | | | | | |
| Consol. Coal | 100 | | | | | | | | | | | | | |
| Cumb. C. & I | 100 | | | | | | | | | | | | | |
| Del. & H. C | 100 | 78½ | 77½ | 79½ | 78½ | 79½ | 78½ | 78⅝ | 78 | 79 | 78⅝ | 80 | 79⅝ | 9,384 |
| D., L. & W. RR | 50 | 103 | 102⅛ | 104⅜ | 103⅝ | 104¼ | 103⅝ | 104⅛ | 103⅝ | 104⅛ | 103½ | 104¾ | 103¾ | 196,866 |
| Elk Lick Coal Co | | | | | | | | | | | | | | |
| Lehigh C. & N.† | 50 | 42¾ | 42⅝ | 43 | 42⅞ | 42⅞ | 42¾ | | | 42⅞ | 42¾ | | | 469 |
| Lehigh Valley RR.† | 50 | 58¾ | 58½ | 58¾ | 58¼ | 58¾ | | | | 58⅝ | 58½ | | | 948 |
| L. & W. C. & I Co | | | | | | | | | | | | | | |
| Maryland Coal | 100 | | | | | | | | | | | | | |
| Montauk Coal | 100 | | | | | | | | | | | | | |
| Morris & Essex | 50 | | | | | | | | | | | | | |
| New Central Coal | 100 | | | | | | | | | | | | | |
| N. J. C. RR | 100 | 35½ | 35⅜ | 36 | 35⅝ | 35⅝ | 35⅝ | 35½ | 35¼ | 35¼ | | 36½ | 35½ | 10,395 |
| N. Y. & S. Coal | 50 | | | | | | | | | | | | | |
| Penn. Coal | 50 | | | | | | | | | | | | | |
| Penn. RR † | 50 | 52 | 51¾ | 52 | 51¾ | 52 | 51¾ | | | 51½ | 51¼ | | | 4,522 |
| Ph. & R. RR.* | 50 | 15 | | | | 15 | | | | 14½ | | | | 1,368 |
| Spring Mountain | 50 | | | | | | | | | | | | | |
| Westmoreland Coal.† | 50 | 60 | | | | | | | | | | | | 32 |

* Of the sales of this stock, 548 shares were in Philadelphia and 820 in New York. Total sales, 224,309.
† The quotations for these stocks are not percentage, but actual price.

has declared a dividend (No. 3) of 10 cents a share, or $40,000, payable May 23d, at St. Louis.

Honorine Mining Company, of Utah, has declared a dividend (No. 3) of 5 cents a share, payable May 20th, at Boston.

Mount Diablo Mill and Mining Company, of Nevada, has declared dividend No. 5, of 20 cents per share, payable May 28th, at San Francisco.

Ontario Silver Mining Company, of Utah, has declared a dividend of $75,000, payable May 29th. Total dividends to date $6,425,000.

### Pipe Line Certificates.

The following table gives the quotations and sales at the Consolidated Stock and Petroleum Exchange:

| | | Opening. | Highest. | Lowest. | Closing. | Sales. |
|---|---|---|---|---|---|---|
| May | 16 | $0.79⅝ | $0.80¼ | $0.79¼ | $0.80 | 5,678,000 |
| | 18 | .80½ | .80⅝ | .79¼ | .79½ | 5,855,000 |
| | 19 | .79⅝ | .79¾ | .79⅝ | .79½ | 2,730,000 |
| | 20 | .79½ | .79⅝ | .79¼ | .79⅜ | 1,780,000 |
| | 21 | 79½ | .80⅛ | .79⅝ | .80 | 4,572,000 |
| | 22 | .80 | .81¼ | .79¾ | .80¾ | 4,981,000 |
| Total sales | | | | | | 25,596,000 |

### San Francisco Mining Stock Quotations.

*Daily Range of Prices for the Week.*

| NAME OF COMPANY. | CLOSING QUOTATIONS. May 15. | May 16. | May 18. | May 19. | May 20. | May 21. |
|---|---|---|---|---|---|---|
| Albion | | | | | | |
| Alpha | | | | | | |
| Alta | .35 | | | .30 | .25 | .35 |
| Argenta | | | | | | |
| Bechtel | | | | | | |
| Belcher | 1.50 | | | 1.12½ | 1.25 | |
| Belle Isle | | | | | | |
| Best & Belcher | 3.50 | | | 4.00 | 4.62½ | 5.00 |
| Bodie | 1.50 | | | 1.50 | 1.50 | 1.50 |
| Bullion | | | | | | |
| Bulwer | | | | | | |
| Challar | 2.12½ | | | 1.87½ | 2.00 | 2.37½ |
| Con. Pacific | | | | | | |
| Con. Cal & Va | 1.75 | | | 1.75 | 2.00 | 2.25 |
| Crown Point | 1.50 | | | 1.50 | 1.50 | 1.37½ |
| Day | | | | | | |
| Elko Cons | | | | | | |
| Eureka Cons | 7.12½ | | | 7.50 | 7.00 | 7.25 |
| Exchequer | | | | | | |
| Gould & Curry | 2.25 | | | 2.37½ | 2.50 | 2.62½ |
| Grand Prize | | | | | | |
| Hale & Norcross | 7.75 | | | 7.12½ | 6.87½ | 7.12½ |
| Independence | | | | | | |
| Martin White | | | | | | |
| Mexican | 1.12½ | | | 1.12½ | 1.00 | 1.37½ |
| Mono | | | | | | |
| Mount Diablo | 4.00 | | | 3.87½ | 3.75 | |
| Navajo | 1.25 | | | 1.25 | 1.25 | 1.25 |
| Northern Belle | | | | | | |
| North Belle Isle | | | | | | |
| Ophir | 1.50 | | | 1.50 | 1.62½ | 1.87½ |
| Overman | | | | | | |
| Potosi | .85 | | | .80 | .80 | .90 |
| Savage | 4.00 | | | 3.75 | 3.87½ | 4.00 |
| Scorpion | | | | | | |
| Sierra Nevada | 1.25 | | | 1.25 | 1.50 | 1.75 |
| Silver King | | | | | | |
| Tip-Top | | | | | | |
| Union Cons | .95 | | | 1.25 | 1.50 | 1.50 |
| Utah | | | | | 1.75 | 1.75 |
| Wales Cons | | | | | | |
| Yellow Jacket | 3.12½ | | | 2.75 | 2.75 | 2.75 |

### Boston Copper and Silver Stocks.

[From our Special Correspondent.]

BOSTON, May 21.

The market for copper stocks the past week has been dull but steady. The offerings have been small, and it has been comparatively easy to fill orders to buy at about the prices of last week. There is not, as yet, any decided feeling either side of the market, but the tone is bullish, and higher prices more likely to rule during the next few months. Ingot copper is steady at the recent advance, and the market will be largely influenced by the course of the ingot market in the near future. Calumet & Hecla was very firm in the early dealings at $164½@$165; but for the past few days, the orders to buy have been light, and the price yielded to $163 for a small lot, recovering, however, to-day to $164, which was the closing bid. Quincy has held firm at $34½@$35, and is in good demand at these figures, with but little stock offered. Franklin sold at $8 freely, and more would be taken at this price, but the supply is very limited, holders believing in higher prices. Allouez sold at 43¾c., which is a slight advance over last sale. Osceola is wanted at $8¾ bid, but none offered under $10.

In silver stocks, Catalpa sold at 25c. Crescent, at 9c. Harshaw, at 20c. Bonanza, at $1⅛.

At the Mining Exchange, there is but little activity. In mining shares, Bowman is dull, but slightly firmer at 12c. bid, 16c. asked; reported sales at 13@14c. The reported purchase of about twenty-five acres of territory adjoining the mine does not seem to have any effect on the stock. Dunkin, steady at 19c. bid. "Cusi" sold at $1⅝. Consolidated Pacific was offered freely at 40c., with no sales, the best bid being about 25c.

In miscellaneous stocks, American Electric and Illuminatting Company common sold at 80c.; preferred stock at $2⅛. Water-meters, dull at 15c. bid for New England, and 17½c. for Standard.

3 P.M.—At the afternoon board, Catalpa sold at 25c. Calumet & Hecla, $164 bid, $165 asked. Quincy, $34 bid, $35 asked. Market generally dull and inactive.

## FREIGHTS.

### Coastwise Freights.

*Per ton of 2240 lbs.*

Representing the latest actual charters to May 21st:

| To | From Philadelphia | From Baltimore. | From New York shipping ports. |
|---|---|---|---|
| Alexandria | .65@.70 | | |
| Annapolis | | | |
| Albany | | | |
| Baltimore | .58§ | | |
| Bangor | | | .80 |
| Bath, Me | 1.00@1.10 | | .80 |
| Beverly | 1.10 | | |
| Boston, Mass | 1.05@1.15 | 1.15@1.35 | .80 |
| Bristol | | | |
| Bridgeport, Conn. | | 1.05* | .50 |
| Brooklyn | | 1.05 | |
| Buffalo, N. Y | | | |
| Cambridge, Mass. | 1.10@1.15‡ | | .80‡ |
| Cambridgeport | 1.10@1.15‡ | | .80‡ |
| Charleston, S. C. | .70@.75 | .80 | |
| Charlestown | | | |
| Chelsea | 1.10 | | .80 |
| City Point | | | |
| Com. Pt., Mass. | | | .80 |
| E. Boston | 1.05@1.10 | | .80 |
| East Cambridge | 1.10@1.15 | | |
| E.Gr'nwich, R. I. | | | |
| Fall River | 1.00 | | .80 |
| Galveston | | 2.50 | |
| Gardiner, Me | | | |
| Georgetown, D.C. | .65@.70 | | |
| Gloucester | 1.10@1.15 | | |
| Halifax | | | |
| Hartford | | | |
| Hackensack | | | |
| Hudson | | | |
| Lynn | 1.15@1.25 | | |
| Marblehead | | | |
| Medford | | | |
| Millville, N. J | | | |
| Milton | | | |
| Newark, N. J | | 1.15 | |
| New Bedford | 1.00@1.10 | 1.00 | .75 |
| Newburyport | | | 1.00 |
| New Haven | | 1.00@1.05 | .50 |
| New London | | 1.00@1.05 | .70 |
| New Orleans | | | |
| New-Berne | | | |
| Newport | 1.10 | | |
| New York | | | |
| Norfolk, Va | .50@.55 | | |
| Norwich | | | .75 |
| Norwalk, Conn | | | |
| Pawtucket | | | |
| Philadelphia | | | |
| Portland, Me | .75*@1.10 | 1.15 | |
| Portsmouth, Va. | .55 | | |
| Portsmouth, N.H. | | 1.30 | 1.00 |
| Providence | 1.00 | 1.05 | .70@.75 |
| Quincy Point | | 1.40 | |
| Richmond, Va | .55@.60 | | |
| Rockland, Me | | | |
| Rockport | 1.35 | | |
| Roxbury, Mass. | 1.10‡ | | |
| Saco | | | |
| Sag Harbor | | | |
| Salem, Mass | 1.10@1.15 | | .80 |
| Saugus | | | |
| Savannah | | 1.00 | |
| Somerset | 1.00 | | |
| Staten Island | | 1.00 | |
| Trenton | | | |
| Troy | | | |
| Wareham | | | |
| Washington | .65 | | |
| Weymouth | | | |
| Williamsbg, N.Y. | | 1.05 | |
| Wilmington, Del. | | | |
| Wilmington, N.C. | | .90 | |
| St. Thomas, W. I. | | | |
| Key West, Fla | | | |

* And discharging. † And discharging and towing. ‡ 3c. Per bridge extra. § Alongside. ‖ And towing up and down. ¶ And towing. ** Below bridge.

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